

Arithmetical Nauigation:

STC 150

O R,

An Order thereof:

Compiled and published for the aduancement
of NAVIGATION:

More particularly,
For the benefit of English Mariners,
or Sea-faring men that delight therein.

By Thomas Addison, *Practitioner in*
the Art of Nauigation.



LONDON,
Printed for Nathaniel Gosse at Radcliffe,
and are there to be sold. 1625.

Alfred Russell Wallace

London 1880

Dear Sir

I have the pleasure to inform you that

the Trustees of the British Museum

have accepted

Yours faithfully
Alfred Russell Wallace



TO
THE RIGHT
WORSHIPFULL,

Sir *Morris Abbot*, Knight, Gouver-
nour: the Worshipful, *Christopher Cletherow*,
Deputy, the worthy Treasurers and
Committies of the Honourable Com-
pany of Merchants of *London*,
trading to the *East-Indies*.

Right Worshipfull,



Being it hath pleased
the Gouvernour of all
things, to make you
Gouvernours and Di-
rectors of the famous
East-Indian Navi-
gations (wherein by
the blessing of God)
upon your prouident
prescriptions (seconded by your seruants endea-
uours)

The Epistle Dedicatory.

uours) the vast Ocean is become a knowne path to the remotest parts of the world, unknowne Regions haue beene, and are daily discovered, an ample trade acquired, and succesfully pursued (untill by the couetousnes, ambition, and intolerable insolence of the bloud-thirsty Netherlanders, East-India Company got disturbance) I haue therefore made choise of your Worships (as the most proper obiekt my thankfulness aimes at) to recommend these first Fruits of my poore endeouours, to your fauourable acceptance and patronage, being the proceed of that Talent God hath giuen me, and which hath by priuate trade beene improved in your seruice, wherein I am now ingaged the second time.

The Worke aimes at the aduancement of Nauigation, by a more exact Method or Order, then formerly hath beene published to the world, whose charitable construction of my paines will bee my sufficient recompence.

- 1 In the first place then, those that will be Practitioners in the Art of Nauigation, ought to bee acquainted with the Sunne and Moones motion, and the Rules to them belonging, for the better
- 2 finding the time of the Tide in any place. Secondly, he ought to be acquainted with the setting of the
Tides

The Epistle Dedicatory.

Tides or Streames, with the Depths and Land-
 markes, for the shunning of Rocks and Sands, in
 his going out, or coming into Roade, Harbour, or
 Riuer. Also to be certaine of the Latitude and Va- 3
 riation of the place he departeth from, or would ar-
 rive at. Fourthly, he ought to know the way of a 4
 Ship. In the fifth place, how to protract a tra- 5
 uerse. In the sixth, the resolution of plaine Chart 6
 Navigation. Senenthly, he must obserue, and know 7
 the disagreements betweene the Meridians on a
 plaine Chart, and the Meridians on a Globe.
 Eighthly, he ought to know the use of Mercators 8
 Chart, (or Planisphare.) Lastly, he ought to know 9
 and understand such Astronomicall questions as
 shall be usefull.

Therefore, for young beginners, they shall haue
 (in this short Treatise) an order of Navigation.
 First, of Rules that are necessary to know the shif-
 ting of the Tides. Secondly, for finding of Lati-
 tudes. Thirldly, for the making and use of a Cylen-
 der halfe minute glasse, for the finding of the way
 of a Ship. Fourthly, to know the use of two pro-
 tractig Tables; the one for Points, Halfes, and
 Quarters, and the other for euery Degree; and of
 a third Table, of 1000. Numbers, with their Lo-
 garithmes, drawne from the Table of that Honou-

The Epistle Dedicatory.

nable, the Lord of Merchiston; and of a fourth, shewing the equall parts of euery minute of the Meridian, from the Equator, to the Paralell of 60. Degrees.

I thought it not fitting to proceed any further, though my intent was, to haue shewed an order of great Circle Nauigation, but wanting time (my imployments in your Worships affaires calling mee away) I referre it to those that haue better leisure and ability to performe it.

All these Tables require the aide and assistance of the renowned Lord of Merchiston his Table, for the better performance of plaine Mercator, or great Circle Nauigation; but all Astronomicall questions by the last. Therefore, if this order of Nauigation be beneficiall to any, let him praise God, and giue him the glory, and let him shew forth His euident workes with honour. Let all men conceale the secrets of a King, but not the workes of the Lord, for we are all created to glorifie God; otherwise we shall proue but vnprofitable seruants, to hide our Masters Talent.

Therefore, to conclude, I most humbly desire your Worships to pardon my presumption, and to accept in good part the labours of a seruant, who hath, and doth, and euer will pray to the eternall
and

The Epistle Dedicatory.

and everliving God, to blesse and prosper your worthy designs in this famous Trade, to the glory of God, the honour and benefit of our Nation, and the enriching of your selves and servants. In assured confidence whereof, I humbly take my leave, and rest

Your Worships devoted Servant
to command,

THOMAS ADDISON.

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P Age 1. Line 33. for Summes, read Moones. pag. 4. l. x. for ruleth, r. cutteth. pag. 7. l. 25. for 83. r. 831. pag. 11. line 8. for rules, r. miles. pag. 11. l. 11. for East, r. West. Pag. 16. l. 8. for difference, r. differentia. pag. 37. l. 2. for 17. 19. r. thelike. pag. 18. for the unknowne, r. the side unknowne. throughout the Booke, for Loge Rente, signe, Cosigne, r. Log. Rumb: sine, Cosine.

Gentle Reader, beare with the faults that have crept into this Impression.

To finde the Golden Number.

ADde one to the yeare of the Lord, and then diuide by Nineteene, & the remainder if any be, shall be the Golden Number, but if nought remaine, then nineteene shall bee the Golden Number: otherwise thus; from the yeare of our Lord deduct 1500, and then diuide the rest by 20, and then the quotient and the remainder shall be the Golden Number.

To finde the Epact.

Augment the Golden Number by 11, and diuide by 30 the remainder is the Epact; but if nought remaine, then 30 is the Epact, otherwise thus; diuide the Golden Number by 3, and if 0 remaine, then is the Golden Number and Epact equall; but if 1 remaine, it is more then the Golden Number by 10; and if 2 remaine, it is more by 20.

To finde the Coniunction.

To the Epact adde the monethes from the beginning of *March* last past, till the end of that moneth, wherein you would know the same; then the amount from 30 if lesse, or from sixtie if more then thirty, leaueth the day of the Coniunction.

To finde the Full and Quarters.

If the day of the Coniunction bee before the 15 day of the moneth, adde 15 vnto the day of Coniunction, and you shall haue the day of the Full: If the Coniunction happen after the 15 day, take away 15 from the number of the day of the Coniunction, and you shall haue the full Moone; the first Quarter is 7 dayes after Coniunction, and the last 7 after the Full.

To finde the Moones Age.

Adde to the day of the Moneth the Epact, and also the moneths from the beginning of *March* to the present moneth, if the product be lesse then thirty it is the Moones age, if it exceed, the surplufage is the Moones age.

To finde the time of the Sunnes South being.

Multiply the Moones age by 4, & diuide by 5 the quotient is houres, and for euery one that remaineth allow 12 minutes, so

may you finde the time that the Moones comming to the Meridian: but note, that betweene the Change and Full shee commeth to the Meridian afternoone, but being past the Full, take 15 from it and the rest multiply by 4 and diuide by 5, and allow for euery remainder as before, so shall you haue the time that the Moone commeth to the Meridian after Midnight.

To finde the time of the Tide in any place.

First you are to consider, at what time the Tyde is on the day of the Coniunction then haue you no more to doe, but to adde to it the time of the moones comming to the Meridian after the Sunne, and you shall haue your demand, the time of the Tyde.

2 Certaine Rules for finding the Latitude.

1 **W**hen the Sunnes declination is toward the eleuated Pole, and the Zenith betweene, you shall adde the declination to the Sunnes distance from the Zenith; so shall you haue the Latitude of the place.

2 When the Sunnes declination is toward the eleuated Pole, and the Zenith betweene the Equator and the Sunne, you shall take the Sunnes distance from the Zenith, out of the declination, so resteth the Latitude.

3 When the Sunnes declination is from the eleuated Pole, and the Zenith betweene, you shall take the Sunnes declination, out of the Sunnes distance from the Zenith, so shall remaine the Latitude of the place.

4 And when the Sunnes declination, and the Sunnes distance from the Zenith shall be equall, with North or South declination; you haue no Latitude at all, for you are then vnder the Equinoctiall.

5 Then the Sunne hath declination towards the Eleuated Pole, and is to be seene vpon the Meridian of North and South not setting, then the declination to the left distance from the Zenith, is the Latitude,

But if you take the Complement of declination out of the greatest distance of the Sun from the Zenith, you shall haue the Complement of Latitude.

By the furthest and neereſt diſtance of the Sun or Starre from the Zenith, for Latitude and Declination.

6 If the Zenith diſtances be both one way, as North or South, then let the leſt be taken out of the moſt, the halfe of the reſt ſhall be the Complement of Declination, and it and the leaſt the Complement of Latitude.

7 But if the one Zenith diſtance bee South and the other North, for one and the ſame thing, as Sunne or Starre, then the leaſt from the moſt, leaueth the double of the Complement Latitude, the demand.

3 How to finde the way of a Ship by a Cilinder halfe minute Glaſſe.

1 **L** Et a Cylinder Glaſſe of a foote or more in length and of $\frac{1}{2}$ or $\frac{3}{4}$ of an inch ouer, be caſed in wood or ſome other thing, hauing an open ſpace of the $\frac{1}{2}$ part of an Inch, and ſhort of each end one Inch; let the ſaid diſtance bee diuided into 120 parts, and the one end of this Glaſſe after the ſand is in iſt to be ſtopt, and the other to haue a Plate as other running Glaſſes haue; and in the ſame a hole that may vent the ſand, from the firſt diuiſion to the laſt of 120, in the time of halfe a minute of time.

2 Let the lower end of this Glaſſe haue a necke of leather of three Inches long, and the one end faſtened to the end of the Glaſſe, and the other to a Boxe of Iuory, or ſome other thing, that ſhall be made a purpoſe for the receiuing of the ſand that runneth forth of the ſaid glaſſe, then ſet a diſtance on the ſhips ſide, of the 120. part of a mile, then if you ſhall finde, that any thing that is houe ouer into the water, that the ſhip ſhall make it to paſſe from the one marke to the other, in the time that the ſand ſinketh 20 parts of 120, which is the 6. part of 120; therefore I ſay that the way of the ſhip is 6. mile in an hower; but you muſt ſtop the ſand with your finger, till ſuch time as the thing commeth againſt the firſt marke, and then let the ſand runne till the thing be againſt the ſecond marke, and then you

are to stop the sand, and to note what diuision it ruleth, for the whole diuision, deuided by the part where the sand is stopt at, shall giue the miles that the ship goeth in an hower.

Or thus; the way of the Ship knowne at one time, how to finde it at any other time, by an vnknown distance, the Cylinder Glasse being also an vnknown time, at the instant of time when you or any other shall make the ship for to goe 6 miles, more or lesse in an hower, by a loge and line at the very same instant, take two places on the Shippes side, not regarding the distance, and note by the Cylinder-glasse the parts cut by the Sand, for any thing that shall passe from the one marke to the other; then shall you multiply the said parts cut by the sand, by the miles that she went by the Loge, as suppose 20; the parts cut by 6 miles she goeth is 120; this number must alwayes bee diuided by the parts that shall be cut at any time after, as suppose it were 40, that should diuide 120, the quotient will bee 3 the miles in an hower, this rule is generall for all times, and the parts that you will haue your Glasse diuided into, may bee what you please, and you need not care whether your Glasse bee halfe a minute of time, for it maketh no matter for the true time, let this be sufficient for the vse of this Glasse, it were a good busines for to make a Cylinder Glasse of two or three howers of time, the which would bee necessary in finding the latitude by morning or euening obseruations of the Sunne.

4 *A protracting Table, for whole, halfe, and Quarter
poynts of the Compasse, for Miles, from 1 to 10, and
so to 20. 30. 40. 50. and if need require to 100.
or more at pleasure.*

THIS Table is diuided into 4 parts, representing 4 points, and each of them into other 4 parts for quarter poynts, and each poynt hath 5 Colomes; the first representeth miles sailed, the second, if any be, is also Miles, the third is parts of a mile, each being diuided into a hundred parts, so that each part is a pace. The fourth Colome is also miles, and the 5 parts
of

of a mile, you may suppose the first Collome to bee Leagues, and so the rest parts according.

2 In the vse of this Table, vnderstand; that the first part may represent the first poynt from a Meridian or parallel, that is from North or South, East or West, and the rest in order according, till you come to the halfe quarter poynt; as for example, suppose I sayle vpon the third poynt from the Meridian which is either a N. E. by N. or S. E. by S. or N. W. by N. or S. W. by S. these foure poynts are each of them three poynts from the Meridian; now say I sayle on any one of these 10 Miles, I demand to know the separation from the Meridian, and the alteration of Latitude, looke in the lower part of the third Colome against 10, and you shall finde 5 miles 56 parts, and 8 miles 31 parts, the first is the seperation, and the second the alteration; but if it were the third poynt from the paralell of E. or W. that is a N. E. by E. S. E. by E. or a S. W. by W. or a N. W. by W. then should the first bee the alteration, and the second the separation.

Therefore take this for a generall Rule, if the Course be nearer the Meridian then the paralell, then the lesser is the separation, and the bigger the alteration; but if the Course be nearer to the paralell then to the Meridian, the contrary, the lesser must be the alteration, and the greater the separation, if on any of the last mentioned Courses, you faile 15 miles, you must adde the number against 5 to the number against 10, so shall you haue 8. 34. and 12. 47. if 20. 30. 40. or 50. you must multiply the number against 10 by 2. 3. 4. or 5. so commeth the demand, and if any Vnites commeth betweene, the tenths worke as before for them, if 100. were failed, adde 0. & cut of the two last so haue you the demand 55. 60. 83. 10.

Againe, in the vse of this Table, in casting vp a trauesse, you must consider that sometimes, it happeneth, that the Courses increaseth, & at other times decreaseth the Latitude, & at some time it may separate East, and at other times West, from the Meridian of the place of departure; therefore obserue this order of worke following.

S

S. $\frac{1}{2}$ E.	10 00 98 09 95	S. S. W.	06 03 06 07 39
S. by E.	20 03 90 19 62	S. W. b. S.	09 05 00 07 08
S. E. b. S.	05 02 78 04 16	S. W.	10 07 07 07 07
Easte.	40 10 00 00 00	South.	4 00 00 40 00
	47 66 33 73		15 13 61 94

E. N. E.	10 09 24 38 3	W. b. N.	05 04 90 00 97
N. E.	04 02 83 28 3	W. N. W.	10 09 24 03 83
N. N. E.	30 11 49 27 72	N. b. W.	09 01 76 08 83
North.	15 00 00 15 00	West.	10 10 00 00 00
	23 56 49 38		35 90 13 63

N

47

47—66

23—56

71—22

51—03

20. 19. Seperat. East.

15—13

35—90

51—03

33—73

61—94

95—67

63—01

32—66. Alter. South.

49—38

13—63

63—01

6 This protracting Table for poynts & quarters hath every mile diuided, or as I should say, giueth the parts of a mile to the 1000000 part; but it shall bee enough to haue any thing found to the 1000 part, and for quick dispatch to the 100 part, or 10 part of a mile, so that then it followeth that you may cut off 4.5 or 6 figures towards the right hand.

7 Againe, in the second protracting table, that shall serue for every degree of Horizon, hath the like diuision of a mile, and you may vse it altogether as the former; but this you must vnderstand that as the one is for points, halfe and quarters; so the second, is onely for degrees from North or South East or West towards the halfe quadrant, and so in vse, it shall serue for the whole circumference of 360-degrees.

8 You may by the first Table finde how many miles shall alter a degree of latitude, on any whole halfe or quarter point of the Compass, after this manner, diuide 60000, by the number that answereth to the difference of latitude. as suppose it were the third poynt from the Meridian, which number is 831, by which I diuide 60000; so commeth 72 miles $\frac{168}{831}$.

But if it were the third point from the paralell, then you should diuide 60000 by 556, so commeth 107 miles $\frac{508}{556}$ parts.

9 But if it be demanded, to know how many miles you depart from the Meridian, in altring one degree, sailing vpon the third roome from the Meridian, you must augment 556 by 60, and then diuide by 83, so commeth 42 miles $\frac{120}{83}$ parts: but if it were the third poynt from the paralell, then you must augment 231 by 60, and then diuide by 556, so commeth 89 miles, $\frac{176}{556}$ parts.

10 Now if I saile vpon the third roome from the Meridian 72 miles $\frac{168}{831}$, and would know the latitude altered, augment the

the the last number by 831, and the cut of three figures towards the right hand, so resteth 60 miles the demand.

Againe, if on the third roome from the Meridian, I sayle as before, 73 miles, and would know the departure from the Meridian, augment this number by 556, so commeth 40 miles ⁵⁸⁸₁₀₀₀ the departure.

11 But if the Course were three points from the parallel, and the distance sayled 108 mile, and the demand to know the Latitude altered; that augment by 556. shall be 60. miles ⁴⁸⁸₁₀₀₀ for the Latitude altered.

But if 108. miles bee sailed on the third course from the Paralell, and you would know the separation from the Meridian, you must augment 831. by 108. so commeth 89. miles 748. parts, the demand.

But if the way sayled bee 108. miles, to alter the Latitude 60. miles, what is the Course, diuide 6000. by 108. so commeth 556. the third poynt from the Paralell the thing demanded.

Againe if the way sayled were 73. miles, to alter 60. miles, what should bee the Course, diuide 60000. by 73. so commeth 821. which is neere the third roome from the Meridian.

13 If the Miles sailed were 108. to separate from the Meridian 89. miles, what is the Course, let 89. bee 89000. the which diuided by 108. the quotient 824. the which is neere the three roomes from the paralell.

If the miles sailed were 73. to separate from the Meridian 40. then diuide 40000 by 73. so commeth 547. the which shall bee neere the third roome from Meridian, the order of all the former demands followeth.

$$\begin{array}{r} 168 \\ 60000 \quad 72 \text{---} \\ 831 \end{array}$$

$$\begin{array}{r} 508 \\ 60000 \quad 107 \text{---} \\ 556 \end{array}$$

(9)

556

831

60

60

33360

120

49860

376

831

40

556

89

831

556

72

72

Miles 59 | 832 Parts.

Miles 40 | 032 parts.

556

831

108

108

miles. 60 | 048 parts

miles 89 | 748 parts.

60000 (555 third
108 from the paralell

60000 (832 third
73 from the Meridian.

39000 | 834 third
108 from Paralell

40000 | 547 neere the
73 third from Meridian.

C

The

The second protracting table, if not for points, halves and quarters, but for degrees from 1. to 45. the which shall serue for the whole Circumference of 360. degrees, obseruing the like order of worke as in the first table, as you may beere obserue.

[illegible]

27-19 31-17 | 0000
65-53 28-45
32-84 51-17
S-93-68 A. 61-29 A. St. 35-30. E.
N-61-29 S-32-39 A.

First as heere you see, draw two Lines, crossing each other at right Angles, and set to the ends of each set Letters to represent, E. S. W. N, then in each quarter towards the part

part that your tranverse tendeth, set it there, naming it with Letters thus; from the *S.* toward the *E.* 10. degrees. 10. miles sailed thereon, or from the *S.* toward the *W.* or from the *W.* towards the *N.* or *N.* towards the *W.* and so in the rest, with this promise, that if the Course bee neerer the *S.* then the *E.* then say from the *S.* toward the *E.* then in the second and third set downe first the miles and parts of separation, and next after the rules and parts of alteration, the which done, add each by it selfe, and then let the Easterly separation be added altogether, and also the Westerly, and then seeke for the difference, and you shall finde it to bee, separation East 35 miles 30 parts: secondly, the Southerne alteration exceedeth the Northerne, by 32 miles 39 parts: so now haue you the two containing sides of a right angled triangle, by which may the Course bee found, and also the miles sailed thereon, by the 11. and 5. propos following. Thus haue I shewed how any Trauismay be protracted and made vpon whole, halfe, and quarter points, or vpon any degree of the *Horizon*, to the 10. or 100. or 1000. part of a mile, this Table may serue for other vses on the Land.

5. For the Miles that altereth a Degree of Latitude, on an Azimuth of 50. Degrees.

AS the Cosine of the Azimuth is to *Radius*, so shall the miles in a degr. of the Meridian, be to the miles sailed on that Azimuth, out of the Logarithmi, of the miles in a degree of Latitude, take the Antilogarithmi, of the Azimuth and the rest, shall bee the Logarithmi, of the miles to alter a degree.

60—28150782

50—4419408

93—23731374

Three things to be considered, the first, whether the Antilogarithmi of the Azimuth, bee lesser, equall or more, then the Logarithmi of the miles, in a degree of Latitude, according

thereunto, the miles sailed, shall bee lesse equall or more then 1000. as by the following worke.

$$\begin{array}{r}
 60-28150782 \quad 60-28150782 \quad d. \quad 60-0000 \\
 80-17507234 \quad 863428150782 \quad 87-52 \quad 3360-29500706 \\
 \hline
 344^{\circ} 10643548 \quad 1000-00000000 \quad 7 \quad 6640-48713796 \\
 \hline
 146^{\circ} 19213090.
 \end{array}$$

Note that when the antilo of the Azimuth, is greater then the Logari of the miles, in a degree of Latitude, you must take the Cosine of the Azimuth, out of the sine of the difference, of one degree of Latitude, and out of the Logari of the rest, take the Antilo of the Azimuth; so resteth the Logari of the miles sayled more then a 1000. the thing sought for.

6. *Sailing on an Azimuth of 50. Degrees, to alter the Latitude 60. Miles, what departure from the Meridian.*

As the Cosine of the Azimuth is to the sine of the Azimuth, so shall the miles of Latitude bee to the miles of departure from the Meridian: Or let the Logari of the Azimuth be added to the Logari of the difference of Latitude, and out of that take the Antilo of the Azimuth, and the rest, shall be the Logari of Miles of departure from the Meridian.

$$60-28150782$$

$$50-2665149$$

$$30815931$$

$$50-4419408$$

$$71^{\circ} 26396523$$

But if the Antilo of the Azimuth, be equall to the summe of the Logari of difference of Latitude and Azimuth, then the departure from the Meridian will be 1000. but if it be greater, then so the Logari of the difference between the sine of Latitude,

tude, and Cosine of Azimuth, adde the Logari of Azimuth, and from that summe take the Antilo of Azimuth, the rest is the Logari of miles, more then 1000. for the departure from the Meridian.

$$\begin{array}{r} \text{Degr. } 60 | 0000 \\ 87-52 | 3360-29500706 \end{array}$$

$$\begin{array}{r} 7 | 6640-48713796 \\ 87 \text{ Degr.} | 13714 \end{array}$$

$$\begin{array}{r} 48727510. \\ 146 \quad 19226804. \end{array}$$

7. Miles sailed 93. $\frac{1}{2}$ on an Azimuth, of 50 Degrees, what miles of Latitude altered.

AS Radius to the Cosine of the Azimuth, so shall the miles sailed, be to the miles of Latitude that is altered.

To the Logari, of the miles sailed, adde the Antilo of the Azimuth, so commeth the Logari of the miles of Latitude, that is altered.

$$\begin{array}{r} 93 : 23731374 \\ 50-4419408 \end{array}$$

$$60-28150782.$$

But if you saile 1000. miles, on any Azimuth, and would know the difference of Latitude, because to a 1000. there is Logari 0. and seeing it is in the first and second place in the rule of proportion: therefore I take the Cosine of the Azimuth, which is 642. the which shall bee the miles of Latitude, that is altered.

But if you saile 1146. miles, on the Azimuth of 87. degrees, to the Logari of the more then a 1000. adde the Antilo of the Azimuth, and to the Logari that commeth, seeke a signe, to the which ad the Cosine of the Azimuth, the summe of both, cutting off 4. figures towards the right hand, shall bee the miles of Latitude that is altered, the demand.

$$\begin{array}{r}
 146:19213090 \\
 87-29500706 \\
 \hline
 7|6640-48713796 \\
 87 \quad 52|3360 \\
 \hline
 60|0000.
 \end{array}$$

8. The Miles sailed $93\frac{1}{2}$ on an Azimuth of 50 . degrees what is the separation from Meridian.

As the Radius to the sine of the Azimuth, so shall the way sailed, be to the miles of departure from the Meridian.

To the Logari of the miles sailed adde the Logari of the Azimuth, so cometh the Logari of Miles of departure, from the Meridian.

$$93:23731374$$

$$50-2665149$$

$$71-26396523$$

But if the miles sailed be 1000 . on any Azimuth, then the sine of the Azimuth shall answer to the demand, the which is 766.

But say the miles sayled were 1146 ; then to the Logari of the more, then a 1000 . adde the Logari of the Azimuth, so cometh the Logari of miles of separation, from Meridian, more then 1000 .

$$146:19213090$$

$$87-13714$$

$$146-19526804$$

9 The Miles sailed $93\frac{1}{2}$ and Latitude altered 60 . Miles, what is the Azimuth.

As the miles sailed, is to the miles of Latitude altered, so shall the Radius be to the Sine of the Azimuth.

Out

Out of the Logari of the miles of Latitude altered take the Logari of the miles sailed, the rest is the Antilo of the Azimuth.

60—38150782

93 : 23731374

50—4419408.

But if the miles sayled bee 1000. and Latitude altered 60. let it be 600000. which shall be the Cosine of the Azimuth, 86-34.

But if the miles sailed, be 146. : more then 1000. to alter 60. miles of Latitude, among the naturall sines, seeke the nearest numbers, and let the Logari of miles sayled bee taken out of the Logari of miles of Latitude altered, or thus halfe each number, and take the Logari of greatest, from the least, so by both shall be found the Antilo of the Azimuth.

60|0000—51162680

30—35068620

1146|3000—21661974

573—: 5567914

87 Deg. 29500706

87—29500706.

10. Miles sailed 93. : and Miles of separation from Meridian 71. : what Azimuth?

AS the miles sailed is to the miles of separation, so shall the Radius be to the sine of the Azimuth.

Out of the Logari of the miles of separation, take the Logari of the miles sailed; so resteth the Logari of the Azimuth.

71 : 26396523

93 : 23731374

50—2665149

But if the miles sailed be 1000. and 766. miles of separation, then shall that 766. be the sine of the Azimuth, that is demanded.

But the miles sailed being 140. and separation 1130. you may cut off the last place, towards the right hand, and then take

take the Logari of the greatest from the least; and so resteth the Logari of the Azimuth.

$$113 - 21803672$$

$$114 - 21715563$$

$$82.24 - 88110.$$

I 1. *Miles of Latitude altered 60. and miles of separation from Meridian 71. $\frac{1}{2}$ what Azimuth?*

As the miles of Latitude altered, is to the miles of Separation, so shall the Radius bee to the tangent of the Azimuth.

Let the Logari of the greatest bee taken out of the Logari of the lesser; so resteth the difference of the Azimuth.

$$60 - 28150782$$

$$71\frac{1}{2} - 26396523$$

$$50 - 1754259.$$

But if the Latitude altered, were 1100. miles, and the separation 1050. you may cut off the last figure towards the right hand; or halfe each number, and then take the Logari of the greater from the lesser; so resteth the difference of the Azimuth.

$$105 - 22537956$$

$$110 - 22072751$$

$$43 - 40 - 465205$$

$$525 - 6443568$$

$$550 - 5978371$$

$$43 - 40 - 465297$$

I 2. *The Separation from Meridian 71. $\frac{1}{2}$ miles, and alteration of Latitude 60. miles, what Azimuth and miles sailed?*

It hath beene in vse for to square each side severall, and then to adde the square number together, and to extract the square root, and so have you the miles sailed.

But heere let the Logari of the greater bee taken out of the Logari of the lesser, and the rest shall be the difference of the Azimuth.

Then Let the Logari of each be taken out of the Logari of the side opposite; so commeth the Logari of miles sailed.

	60—28150782	
	71 $\frac{1}{2}$ —26396523	
28150782	<hr/>	Dgr. 26396523
4419408	40 De. 1754259	50— 2665149
<hr/>		<hr/>
92 $\frac{1}{2}$ —23731374	93 $\frac{1}{2}$ —	23731374

Let these 8 propos. suffice for right angled triangles in the use of plaine Navigation, there remaineth for oblique right lined triangle: which is usefull for finding distances in sight, by the helpe of a Magneticall Instrument.

13. Two sides of an Angle giuen to finde the vnknowne Angles.

AS the Sunne of both the sides is to the difference of the sides, so shall the tangent of halfe the two vnknowne Angles be to the tangent of an arch, the which added to the halfe of the two vnknowne, giueth the greater, and taken from that halfe, leaueth the Lesser,

Or thus: from the Logari of the difference of the sides, take the difference of the halfe of the two vnknowne Angles, and from that the Logari of the summe of the sides; so there will rest the difference of an Angle, the which to the halfe of the two vnknowne shall be the greater, but if you take it from the halfe of the two vnknown, it leueth the lesser.

144	79 Degr.	76—25770224
68	101	50 $\frac{1}{2}$ — 1931766
—	50—30.	<hr/>
212	23—30.	23838458
—	<hr/>	212—15511688
76	74—00	<hr/>
	27—00	23—30—8326770.

D

By

By the sides 144. and 68. with the Angle betweene of 79. Degrees, by the order obserued, the one Angle is found to bee 74. Degrees, and the other 27. degrees, and for the side opposite to any Angle.

14. Two Angles, & a side opposite to one is for the side opposite to the other.

You must consider, that as the signe of an Angle, is to the side opposite to it; so shall the signe of an Angle, knowne, be to a side opposite vnknowne.

Therefore it followeth, that as the Logari, of angle is to the side opposite to it; so shall the Logari of an angle knowne, be to the Logari of the vnknowne.

27 Dc. 7896787

144—19379420

27276207

74 dc. - 395086.

68—26881121

15. Two sides of an vnknowne Angle, being giuen with an Angle opposite to one, to finde the Angle opposite to the other.

By the former worke, as the side opposite to an Angle, is to the signe of the same Angle; so shall the side opposite to an vnknowne Angle, be to the Angle vnknowne.

Therefore to the Logari of the side opposite to the vnknowne Angle, adde the Logari of the Angle knowne, and from that summe take the Logari of the side opposite to the Angle knowne; so resteth the Logari of the Angle vnknowne.

(19)

147—19379420

27—7896787

27276207

68—26881121

74 deg. 395086.

16. *Two sides of an vnknowne Angle, with the Angles opposite to each, to finde the vnknowne side.*

First you are to consider, that the three Angles of any right lined triangle, is equall to two right Angles, therefore the two being added, & taken from 180. leaueth the third Angle, then may the side vnknown be found by the former work: For by the 14. Proposition as the signe of any one Angle, is to the side opposite to it, so shall the signe of an Angle be to the side opposite to it.

First finde out the quantity of the vnknowne Angle, and then as the Logari of the Angle, to the Logari of the side opposite to it; so shall the Logari of the Angle last knowne, be to the Logari of the side that is vnknowne.

27

79—185437

74

144—19379420

101

19564857

79

74—395086

147—19169771.

17. *To finde the proportion of the sides, by hauing the three Angles.*

THe sides haue the like proportion as the fines of their Angles, for let the three Angles bee 79-74-27. I say as the sine of one Angle is to the sine of the other, so shall the side op-

posite to 79. bee 147. and that to 74. shall bee 144. and that opposite to 27. degr. 68.

To the Logari of 147. adde the Logari of 74. degrees, and from that take the Logari of 79. degrees; so resteth the Logari of 144.

Againe to the Logari of 144. adde the Logari of 27. Degrees, and from that summe, take the Logari of 74. degrees; so resteth the Logari of 68.

$$147 - 19169771$$

$$74 - 395086$$

$$19564857$$

$$79 - 185437$$

$$144 - 19379420$$

$$144 - 19379420$$

$$27 - 7896787$$

$$27276207$$

$$74 - 395086$$

$$68 - 26881121$$

18. To finde an Angle by knowing the three sides.

As the base or longest side, is to the summe of the two other sides; so shall the difference of the sides, bee to the alterne base, found, the which added to the true base, and the halfe thereof shall be the greater Case, the which from the true base, leaueth the lesser Case, then may the perpendicular and also any of the three Angles be found.

To the Logari of the difference of the sides, adde the Logarithmi of the summe of the sides, and from that take the Logari of the base; so resteth the Logari of the alterne base, then adde it to the true base, and then the halfe thereof shall be the greater case, the which taken from the whole base, leaueth the lesser case, then may the perpendicular, and also any of the three Angles be found.

$$147$$

$$-$$

$$144$$

$$68$$

$$-$$

$$213$$

$$76 - 25770224$$

$$212 - 15511688$$

$$41281912$$

$$147 - 19169771$$

Alterne base.

109: 32112141

147

128:

256:

Greater Case

128:

Lessef Case.

18:

Now, by the subtendant side and containing side of a right lined triangle, may the length of the perpendicular be found, but at this time I haue no great vse of the perpendicular, therefore I say, in this triangle, as the greater or lesser side of the triangle given, isto the greater or lesser case, so shall Radius be to the Cosigne of the acute angle, sought for.

Thersfore if you take the Logari of the biggest side out of the Logari of the greater Case, there will rest the Antilo of the acute angle, the like worke for the other, for the finding of the other acute angle, and so by both to finde the third Angle, to conclude.

128: 20537797

18: 39769097

144-19379420

68-26881121

27-0-1158377

74-12887976.

Now 27. Degrees and 74. degrees maketh 101. the which from 168. leaueth 79. for the third Angle; so haue you your Demand.

These 6. last propof. are of excellent vse for the finding the distance of a Cape, Land, or Iland, by helpe of a Magneticall Instrument necessary for the purpose.

D₃

Now



Now followeth the Increase and Decrease, or the widening or narrowing of the
meridians and Parallels in a Globe.

1. *In the Latitude of 50. I demand how many miles of the meridian, or Equator is a Degree of Longitude.*

AS the Radius to the Cosigne of Latitude, so shall the miles in a degree of the Equator or Meridian, bee to the like miles to answer a degree of Longitude.

To the Logari of miles in a degree of the Meridian, adde the Antilogri of the Latitude, so there shall come forth the Logari of miles of Meridian or Equator, the which shall answer a degree of Longitude.

60—28150782

50—4419408

38—32570190.

2. *What Longitude answereth to 77. miles of the Meridian in the parallel of 50. Degrees.*

AS the Cosigne of the Latitude is to the Radius, so shall the miles of the Meridian, bee to the miles of Longitude in that Parallel.

Out of the Logari of the miles of the Meridian, take the Antilogri of the Parallel, so resteth the Logari of miles of Longitude in that Parallel.

(23)

77—35611361

50—4419408

120—31201953

3. *In the Paralell of 40. Degrees what a signe of thirty Degrees.*

AS the Radius to the Cosigne of the Paralell, so shall the signe of 30. bee to the signe sought for.

To the Logari of 30. degrees adde the antilogari of the Paralell; so commeth the Logari to the demand.

30—6931469

40—2665149

383—9596618

4. *In the Paralell of 60. what miles of Equator or meridian a minute of time.*

AS Radius to the Cosigne of the Parallel, so shall 15. the miles of a minute of time, In the Equator bee to the like in the Paralell.

To the Logari of miles in a minute of time vnder the Equator adde the Antilo, of the Paralell; so commeth the Logari of Demand.

15—43010896

50—6931469

7—148941365.

5 *Two meridians vnder the Equator 200. leagues, In an unknowne Paralell, they are 90. ? demand that Paralell.*

AS the 200 is to 90. so shall the Radius bee to the Cosine of Parallel, therefore out of the Logari of 90. Leagues take

Take the Logari of 200. so shall rem aine the Antilo of the Par-
all sought for.

$$90-24079446$$

$$200-16094379$$

$$63-1537985067.$$

6. Under the Equator 100. Leagues betweene two meridi-
ans, what Latitude 58. Leagues.

As 100. isto 58. so shal Radius be to the Cosigne of the La-
titude.

Therefore let the Logari of the greater bee taken out
of the Logari, of the lesser, so resteth the Antilo of the La-
titude.

$$58-38473143$$

$$100-23035928$$

$$54-33-5447215.$$

7. In the Paralell of 50. Degrees 38 1/2 miles of the me-
ridian, what Longitude?

As the Cosigne of Paralell is to the Radius, so shall the
miles of the Meridian bee to the miles of Longitude in
that Paralell.

Therefore, out of the Logari of the miles of the Meridian
on the Paralell take the Antilo, of the Paralell, so commeth
Logari of the miles of Longitude on the Paralell.

$$38\frac{1}{2} 32570190$$

$$50-4419408$$

$$60-28150782$$

8. If 120. miles of a Paralell be equal to 77. of a meridian, what Paralell is it.

As the miles of the vnknowne Paralell is to the miles of the Meridian, so shall the Radius bee to the Cosigne of the Paralell.

Therefore let the Logari of the miles of Longitude in the vnknowne Paralell be taken out of the Logari of miles of the Meridian, so there resteth the Antilogari of the Paralell.

$$\begin{array}{r} 77-25621361 \\ 120-2120195 \\ \hline 50-4419408 \end{array}$$

9. In the Paralell of 40. a signe of 383. what arke thereunto.

As the Cosine of the Paralell to Radius, so shall the signe that is giuen, be to the signe of the arke demanded.

From the Logari of the signe giuen, take the Antilogari of the Paralell, so resteth the Logari of the Arke sought.

$$\begin{array}{r} 383-9596618 \\ 40-2665149 \\ \hline 30-6931499 \end{array}$$

10. If 7 $\frac{1}{2}$ miles of the meridian darth answer to one minute time, demand in what Paralell?

As the most miles, or 15, is to 7 $\frac{1}{2}$, so shall the Radius be to the Cosine of the Paralell the thing demanded.

Therefore, let the Logari, of a minute of the Meridian, so shall rest the Antilo of the paralell.

$$\begin{array}{r} 7\frac{1}{2}-48942365 \\ 15-42010896 \\ \hline 60-6931469 \end{array}$$

11. In Paralell 63.15. 90. Leagues betweene two meridians, what under the Equator.

As the Cosigne of the Paralell is to the Radius, so shall 90. Leagues betweene two Meridians on the Paralell, bee to their distance vnder the Equator.

Therefore, let the Antilo of the Paralell be taken out of the Logari, of the distance between the two Meridians on the Paralell, so the rest shall be the distance vnder the Equator.

$$\begin{array}{r} 90-24079446 \\ 63-15-27985067 \\ \hline 200-16094379 \end{array}$$

12. If under the Equator, 100. Leagues betweene two meridians, what in 54. 33.

As the Radius is to the Cosigne of Latitude so shall the distance vnder the Equator be to the distance on the paralel.

Therefore to the Antilo of the Latitude, adde the Logari of the distance vnder the Equator, so commeth the distance on the Paralell.

$$\begin{array}{r} 100-23025928 \\ 54-33-5447215 \\ \hline 58-28473143 \end{array}$$

13. In an unknowne paralell where 38 $\frac{1}{2}$ miles of Meridian answereth to 60 of latitude, what is that paralell.

As the miles of Longitude is to miles of the Meridian, so shall the Radius be to the Cosigne of the Paralell.

Therefore, if you take the Logari, of the Longitude, out of the Logari of the miles, of the Meridian, there will rest the Antilo of the Paralell.

$$\begin{array}{r} 38\frac{1}{2}-32570190 \\ 60-28150782 \\ \hline 50-4419408 \end{array}$$

14. In the Parallell of 50 Degrees, 120 miles of Longitude, what of the Meridian.

As Radius to Cosigne of the Parallell, so shall the miles of Longitude on the parallel, be to miles of the Meridian.

Therefore let the Antilogari, of the parallel be added to the Logari of the miles of Longitude on the parallell, so commeth Logari, of miles of Meridian.

$$120 - 21201953$$

$$50 - 4419408$$

$$77 - 25621361$$

15. If 300 be the signe of 30 Degrees in the Equator, and 383. the like signe to a Parallell vnknowne, what parallell is it?

As the signe of the Arke given, is to the signe given of the like, so shall the Radius be to the Cosigne of the Parallell vnknowne.

Therefore out of the Logari, of the signe of the vnknowne parallell, take the Logari of the knowne for the Equator, and there shall remaine the Antilogari of the vnknowne parallell.

$$383 - 9596618$$

$$500 - 6931469$$

$$40 - 2665149$$

16. If $7\frac{1}{2}$ miles of meridian be a minute of time in the parallel of 60, how many is a minute vnder the Equator?

As the Cosigne of 60 degrees to the Radius, so shall the miles of the Meridian a minute of time in 60 to the miles vnder the Equator. Therefore out of the Logari of the miles of the Meridian, that maketh a minute of time on the parallel, take the Antilo of the parallel, so resteth the Logari of miles for a minute vnder the Equator.

$$7\frac{1}{2} - 48942365$$

$$60 - 6931469$$

$$15 - 42010896$$

17. *Two Meridians under the Equator, 200 leagues,
What in the Paralell of 63. — 15 ½*

As Radius to the Cosine of the Latitude, so shall the distance between them, under the Equator, to their distance in the Paralell. Therefore, let the Antilo of the Latitude be added to the Logari, of the distance under the Equator; so cometh Logari of distance.

$$\begin{array}{r} 200 - 16094379 \\ 63 - 15 \frac{1}{2} - 7985067 \\ \hline \end{array}$$

$$90 - 24079446$$

18. *In Paralell 34 - 33 two Meridians 12 Leagues,
What under the Equator.*

As the Cosine of the Paralell is to Radius, so shall the distance on the Paralell, to the distance on the Equator.

Therefore from the Logari, of the distance in the paralell, take the Antilo of the paralell; so cometh the Logari of the distance.

$$\begin{array}{r} 58 - 28473143 \\ 54 - 33 - 5447215 \\ \hline \end{array}$$

$$100 - 23025928$$

19. *Two Meridians in 70 Degrees: 32 Leagues, what
are they in 30 Degrees.*

As the Cosine of 70, to the Cosine of 30, so shall the distance in 70, be to the distance in 30. Let the Antilo of 30 degrees be added to the Logari of 32 leagues, and from that summe take the Antilo of 70 degrees, so shall be left the Logari of distance.

$$32 - 34420180$$

$$30 - 1438410$$

$$35858590$$

$$70 - 10728852$$

$$81 - 25129738$$

20. *Two Meridians in 30 Degrees, distance 31 leagues,
what in 70 Degrees.*

As the Cosine of 30 degrees, to the Cosine of 70 degrees,
so shall 81 leagues bee to the Leagues demaunded. To
the Logari of 81, adde the Antilo of 70, and from that take
the Antilo of 30 degrees, so resteth the Logari of distance.

81 — 25129738

70 — 10728852

35858590

30 — 1438852

32 — 34420180

21. *Two Meridians distant 31 Leagues in 70; in what
parallel are they distant 81 leagues.*

As the 32 is to the Cosine of 70 Degrees, so shall 81
Leagues bee to the Cosine of the Parallell of Latitude.

To the Logari of 81, adde the Antilo of knowne Latitude,
and from it take the Logari of distance in Latitude knowne,
so there resteth the Antilo of Parallel, or Latitude vnkowne.

81 — 25129738

70 — 10728852

35858590

32 — 34420180

30 — 1438410

22. *The Distance of 31 Leagues betweene two Meri-
dians in 30 Degrees: In what parallel they are
distant 32 leagues.*

As 81 is to 32, so shall the Cosine of 30 Degrees bee to
the Cosine of parallel.

(30)

Let the Antilo of 30 degrees be added to the Logari of 32 leagues, and from that take the Logari of 81, so resteth Antilo of latitude.

32 — 34420180

30 — 1438410

35858590

81 — 25129738

70 — 10728852

23. One Latitude $14\frac{1}{2}$, and another $49\frac{1}{2}$ — a Meridian distance betweene 561 miles, what Longitude?

AS the halfe of the Cosignes of both Latitudes is to Radius, so shall the miles of Meridian distance bee to miles of Longitude, out of the Logari of the miles of Meridian distance, take the Antilo, of halfe Cosignes of latitudes, so commeth Logari, of miles of longitude.

561 — 5780317

885 — 2169129

696 — 3611188

24. A Longitude of 696 miles betweene Latitude $14\frac{1}{2}$ and $49\frac{1}{2}$ what Meridian distance.

AS Radius to the halfe of the Cosignes of both Latitudes, so shall the miles of Longitude, bee to the miles of Meridian distance.

To the Logari of miles of Longitude, adde the Antilo of halfe Cosignes of Latitudes, so commeth the Logari of Meridian distance.

696 — 3611188

805 — 2169129

561 — 5780317

Let

Let these few propositions suffice, to shew the disagreement betweene the Meridians in a Globe, and the common Sea-Chart: the following businesse shall be the vse of *Mercators Projection*.

1. *The Longitude and Latitude of two places
to finde the Rumb.*

L Et the two places bee the Lixard, in Latitude 50 degrees, and the Iland of Flores, in 39 - degrees 20; the difference of Longitude 26 degrees, not by the way: if the parts of Latitude difference bee greater then that of Longitude difference, the Rumb is neerer the Meridian then the Parallell; but if lesse, then the contrary. Therefore if the parts of Latitude be greatest, let the Logari of the Latitude parts bee taken out of the Logari of the Longitude parts: so resteth the Difference of the Rumb from the Meridian. But if the parts of Longitude bee greatest, as in this proposition, let the Logari of the parts of Longitude bee taken out of the Logari of the parts of Latitude; so shall rest the difference of the Rumb from the Parallell.

$$\begin{array}{r|l} 903846 & 1 - 24036803 \\ 1560000 & 0 - 18578994 \end{array}$$

$$30 - 5 - 5457809$$

2. *The Rumb and both Latitudes for the distance
betweene both places.*

L Et the two places bee the Lixard and the Iland of Flores and the Rumb to bee 30 Degrees 5. from the Parallell.

Let the Logari of the Rumb from the Parallell bee taken out of the Logari of the miles difference of Latitude; so shall rest the Logari of the miles of distance.

(32)

$$\begin{array}{r}
 640 | 0000 - 27488710 \\
 30 - 5\frac{1}{4} - 6906319 \\
 \hline
 1276 \\
 425 \text{ L. } \frac{1}{3} \quad 1276 | 786 - 20582391
 \end{array}$$

3. *The Distance and both Latitudes to finde the Rumb.*

L Et the Latitudes be as before, and the distance the same that was last found.

From the Logari of the miles difference of Latitude, take the Logari, of the miles of distance, so resteth the Logari of the Rumb from the Parallell.

$$\begin{array}{r}
 640 | 0000 - 27488710 \\
 1276 | 786 - 20582391 \\
 \hline
 \end{array}$$

$$30 - 5 - 6906319$$

4. *The Rumb and both Latitudes, to finde the difference of Longitude.*

L Et the Rumb be the same last found, and the Latitudes as before; then let the differentia of the Rumb, be taken out of the Logari, of the parts of Latitude difference, so shall rest the Logari, of the parts of Longitude.

$$\begin{array}{r}
 903846 | 1 - 24036803 \\
 30 - 5\frac{1}{4} | - 5457809 \\
 \hline
 \end{array}$$

$$\begin{array}{r}
 156 | 0000 | 0 - 18578994 \\
 26 - 00
 \end{array}$$

5. *The difference of Longitude, the Rumb, and one Latitude, to finde the other Latitude.*

L Et one Latitude be $39 - 20$, and the Rumb 30 degrees, $7\frac{1}{4}$ to the Northwards of East part of the Parallell, and let the difference of Longitude be 26 degrees.

To

To the Logari, of the parts of Longitude, adde the Difference of the Rumbe, so commeth the Logari, of the parts difference of Latitudes, the which parts to the parts of the knowne Latitude, shall giue the parts for vnknowne Latitude.

$$\begin{array}{r}
 156 | 00000 - 18578994 \\
 30 - 5 - 5457809 \\
 \hline
 903846 | 1 - 24036803 \\
 39 - 30 - 2570754 | 6 \\
 \hline
 50 - 00 - 3474600 | 7
 \end{array}$$

6. *The Rumbe, and Distance and one Latitude, to finde the other Latitude.*

L Et the Latitude giuen be 39 degrees, 20, and the distance the same that was found in the second proposition, and the Rumbe the same that was giuen in that proposition.

Therefore to the Logari of the Distance, adde the Logari of the Rumbe from the Paralell, so commeth the Logari, of the miles difference of Latitude; the which adde to the knowne Latitude, shall giue the Latitude vnknowne.

$$\begin{array}{r}
 1276786 - 20582391 \\
 30 - 5 \frac{1}{2} - 6906319 \\
 \hline
 640 | 0000 - 27488710 \\
 \hline
 10 | 40 \\
 39 | 20 \\
 \hline
 50 | 00
 \end{array}$$

7. *By one Latitude, Rumbe, and Distance, to finde the difference of Longitude.*

BY the sixt Proposition finde the other Latitude, and so the parts of the Meridian between both Latitudes, then from
 E the

the Logari, thereof take the differentia of the Rumb, so shall
rest the Logari, of the parts of Longitude.

$$\begin{array}{r} 903846 | 1 - 24036803 \\ 30 - 5 \frac{1}{2} | \hline 5457809 \end{array}$$

$$156 | 0000 | 0 - 18578994$$

$$26 | 00$$

8. *By one Latitude, Rumb, and difference of Longitude, to finde the distance.*

BY the fifth proposition find the parts of the Meridian between both Latitudes, with the miles answering thereunto; and by the second proposition finde distance between both places.

$$\begin{array}{r} 1560000 | 0 - 18578994 \\ 30 - 5 - | \hline 5457809 \end{array}$$

$$\begin{array}{r} 903846 | 1 - 24036803 | 640 | 0000 - 27488710 \\ 39 - 30 - 2570754 | 6 \hline 30 | 5 - 6906319 \end{array}$$

$$30 - 00 - 3474600 | 7 \quad 1276 | 786 - 20582391$$

Leagues--425 $\frac{1}{2}$

9. *By the Latitudes, and Distance, and Rumb, to finde the difference of Longitude.*

BY the Latitudes, and Rumb, is the distance found by the second proposition, and by the Rumb and both Latitudes is the difference of longitude found by the fourth proposition.

$$\begin{array}{r} 640 | 0000 - 27488710 | 903846 | 1 - 24036803 \\ 30 | - 5 - 6906319 | 30 - 5 | \hline 5457809 \end{array}$$

$$1276 | 786 \quad 20582391 | 156 | 0000 | 0 - 18578994$$

425 $\frac{1}{2}$

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As to

Astronomical Propositions.

1. *The Distance of the Sunne from the next Equinoctiall point 30 Degrees, to finde his Declination.*

Let the Logari of the Sunnes distance, from the next Equinoctiall point, bee added to the Logari of the Sunnes greatest declination, the summe thereof is the Logari of the declination.

$$23-30-9194226$$

$$30-00-6931469$$

$$11-30-16125695$$

2. *The Latitude 51-32 and Declination 23-30, to finde the Amplitude.*

From the Logari of the Sunnes declination, take the Antilo of the Latitude, so resteth the Logari of Amplitude.

$$23-30-9194226$$

$$51-32-4747198$$

$$39-52-4447028$$

3. *The Latitude 51-32, and Declination towards Latitude 23-30, at what time doth the Sun rise and set.*

From the differentia of the declination, take the differentia of the Latitude, so shall rest the Antilo: of the time after midnight; but if the declination be from the Latitude, it shall be the Logari: of time after the houre of sixe.

$$23-30-8328403$$

$$51-32-230593$$

$$33-11-6027810-56-49$$

Setting. -8-13 Rising. 3-47

F 1

But

But if the Declination bee from the Latitude, as much as it was towards the Latitude, then shall the time of Rising be the time of Setting, and Setting the Rising.

4. *The Sunne in the last minute of Aries to finde the right Ascension.*

From the Antilo of the Sunnes place, from the next Equinoctiall poynt, take the Antilo of the declination, the rest shall be the Antilo: of the right Ascension.

$$30 - 00 - 1438410$$

$$11 - 30 - 202795$$

$$27 - 54 - 1235615$$

5. *The Latitude $51\frac{1}{2}$, and declination $23\frac{1}{2}$: for the time of an East Sunne.*

TO the Differentia, of the Declination, adde the Differentia of the Latitude, the Sunne, the Logari, of time after fixe.

$$23 - 30 - 8388408$$

$$51 - 30 - 2288650$$

$$20 - 14 - 10617053$$

6. *The Latitude $51\frac{1}{2}$, and Declination $23\frac{1}{2}$, for Altitude of an East Sunne.*

From the Logari, of the Declination, take the Logari, of the Latitude, so resteth the Logari of the Altitude.

$$23 - 30 - 9194226$$

$$51 - 30 - 2451230$$

$$30 - 38 - 6742996$$

7. *The Latitude $51\frac{1}{2}$, and Declination $23\frac{1}{2}$: for the Sunnes Altitude at fixe.*

TO the Logari of the Declination, adde the Logari of the Latitude; so commeth the Logari of Altitude.

$$23 - 30 - 9194226$$

$$51 - 30 - 2451230$$

$$18 - 11 - 11645456$$

8. *The Latitude $51\frac{1}{2}$, and Declination $23\frac{1}{2}$: for the Azimuth of fixe.*

TO the differentia of the declination, adde the Antilo: of the Latitude; so commeth the differentia of the Azimuth.

$$23 - 30 - 8328403$$

$$51 - 30 - 4739880$$

$$74 - 51 - 13068283$$

9. *The Azimuth 90 , and Altitude $30 - 38$, and declination 23 degrees $\frac{1}{2}$, What time.*

LEt the Antilo: of the declination, be taken out of the Antilo: of the Latitude, so shall rest the Logari: of the time, wanting of Noone.

$$30 - 38 - 1503047$$

$$23 - 30 - 865823$$

$$69 - 46 - 637224$$

10. *The time wanting of Noone $69 - 45$, and Altitude, $30 - 38$, and Declination $23\frac{1}{2}$, what Azimuth.*

TO the Antilo, of the Declination, adde the Logari, of the time wanting of Noone, and from that summe take the Antilo, of the Altitude, so resteth the Logari, of the Azimuth.

(38)

23—30—865823

69—46—637224

1503047

30—38—1503047

90—00—0

1. In Sphericall, oblique Triangles, three sides
given for an Angle opposite to one.

The one side, 40 Degrees, and the other 43 degrees, 20
and the other 30 degrees, 30, for the Angle opposite to
the last.

86—30—9981348

6—30—1132032

8849316

4424658—8152027

30—30—8616292

1365056—19908832

46—15—3087403—11756805

2. The Almicanter of two Starres with their distance,
for the difference of Azimuth betweene them.

The ones Almicanter 56, and the other 34, and the di-
stance betweene them 37—56.

68—9271829

4635919—7686324

37—56—7887266

1384573—19275652

45—27—2984857—12089328

3. The

3. *The Latitudes of two places, with the great Circle distance, for Longitude difference.*

L Et the one place bee in Latitude 21, and the other in 56, and the great Circle distance 47 degrees.

$$\begin{array}{r}
 55 - 8191520 \\
 13 - 2249511 \\
 \hline
 10441031 \\
 520515 - 6500026 \\
 47 - 6819984 \\
 \hline
 1371536 - 19866327
 \end{array}$$

$$42 - 30 - 2627505 - 13366301$$

4. *In Sphericall oblique Triangles, two sides, with an Angle, for the third side.*

THe Declination of two Starres, with their difference of right Ascension, for their distance, supposing the one to haue declination 50, and the other 46, and difference of right ascension, 46 - 15.

$$\begin{array}{r}
 86 - 20 - 9981348 \\
 6 - 30 - 1132032 \\
 \hline
 8849316 \\
 4424658 - 8152027 \\
 46 - 15 - 3084869 - 11761509 \\
 \hline
 1365802 - 19913536 \\
 30 - 30 - 8615546
 \end{array}$$

5. *The*

5. *The Latitude, the Altitude, and Azimuth, for the declination of a Starre.*

L Et the Latitude be 56 degrees, the Altitude 34, and the Azimuth 45 - 27 minutes.

68 — 9271839

4635919 — 7686324
45 - 27 — 2982613 — 12099637

1383089 — 19785961

37 - 56 — 7888750 -

6. *The Latitude of two places with the difference of Longitude for the great Circle distance.*

L Et one place be in Latitude 56, and other in 21, differing in Longitude 42 - 30, for great Circle distance.

55 — 8191520

13 — 2249511

10441031

5220515 — 6500036
42 - 30 — 2627227 — 13366493

1371564 — 19866519

47 - 00 — 6819956.

F I N I S.

1	0	049	0677	0	998	7954
2	0	098	1354	1	997	5908
3	0	147	2031	2	996	3862
4	0	196	2708	3	995	1816
5	0	245	3385	4	993	9770
6	0	294	4062	5	992	7724
7	0	343	4739	6	991	5678
8	0	392	5416	7	990	3632
9	0	441	6093	8	989	1586
10	0	490	6770	9	987	9540
1	0	098	0171	0	995	1847
2	0	196	0342	1	990	3694
3	0	294	0513	2	985	5541
4	0	392	0684	3	980	7378
5	0	490	0855	4	975	9235
6	0	588	4026	5	971	1082
7	0	686	1197	6	966	2929
8	0	784	1368	7	961	4776
9	0	882	1539	8	956	6623
10	0	980	1710	9	951	8470
1	0	146	7305	0	989	1765
2	0	293	4610	1	978	3530
3	0	440	1915	2	967	5295
4	0	586	9220	3	956	7060
5	0	733	6525	4	945	8825
6	0	880	3830	5	935	0590
7	1	027	1135	6	924	2355
8	1	173	8440	7	913	4120
9	1	320	5745	8	902	5885
10	1	467	3050	9	891	7850
1	0	195	0903	0	980	7853
2	0	390	1806	1	961	5706
3	0	585	2709	2	942	3559
4	0	780	3612	3	923	1412
5	0	975	4515	4	903	9265
6	1	170	5418	5	884	7118
7	1	365	6321	6	865	4971
8	1	560	7224	7	846	2824
9	1	755	8127	8	827	0677
10	1	950	9030	9	807	8530

1	0	242	9802	0	970	0312
2	0	485	9604	1	940	0624
3	0	728	9406	2	910	0936
4	0	971	9208	3	880	1248
5	1	214	9010	4	850	1560
6	1	457	8812	5	820	1872
7	1	700	8614	6	790	2184
8	1	943	8416	7	760	2496
9	2	186	8218	8	730	2808
10	2	429	8020	9	700	3120
1	0	290	2848	0	956	9404
2	0	580	5696	1	913	8808
3	0	870	8544	2	870	8212
4	1	161	1392	3	827	7616
5	1	451	4240	4	784	7020
6	1	741	7048	5	741	6424
7	2	031	9936	6	698	5728
8	2	322	2784	7	655	5232
9	2	612	5632	8	612	4636
10	2	902	8480	9	569	4040
1	0	336	8899	0	941	5440
2	0	673	7798	1	883	0880
3	1	010	6697	2	824	6320
4	1	347	5596	3	766	1760
5	1	674	4495	4	707	7200
6	2	021	3394	5	649	2640
7	2	358	2293	6	590	8080
8	2	695	1192	7	532	3520
9	3	032	0091	8	473	8960
10	3	368	8990	9	415	4400
1	0	382	6834	0	923	8795
2	0	765	3668	1	847	7586
3	1	148	0502	2	771	6379
4	1	530	7336	3	695	5172
5	1	913	4170	4	619	3965
6	2	396	1004	5	543	2758
7	2	678	7838	6	407	1551
8	3	061	4672	7	391	0344
9	3	444	1506	8	314	9137
10	3	826	8340	9	238	7930

1	0	427	5552	0	803	9893
2	0	855	1104	1	807	9786
3	1	282	6656	2	711	9679
4	1	710	2208	3	615	9572
5	2	137	7760	4	519	9465
6	2	565	3312	5	423	9358
7	2	992	8864	6	327	9253
8	3	420	4416	7	231	9144
9	3	847	9968	8	135	9037
10	4	275	5520	9	039	8930
1	0	471	3967	0	881	9212
2	0	942	7934	1	763	8424
3	1	414	1901	2	645	7636
4	1	885	5868	3	527	5848
5	2	356	9835	4	409	6060
6	2	828	3802	5	291	5272
7	3	299	7769	6	173	4484
8	3	771	1736	7	055	3696
9	4	242	5703	7	937	2908
10	4	713	9670	8	819	2120
1	0	514	1027	0	857	7286
2	1	028	2054	1	715	4572
3	1	542	3081	2	573	1858
4	2	056	4108	3	430	9144
5	2	570	5135	4	288	6430
6	3	084	6162	5	146	3716
7	3	598	7189	6	004	1002
8	4	112	8216	6	861	8288
9	4	626	9243	7	719	5574
10	5	141	0270	8	577	2860
1	0	555	5702	0	831	4696
2	1	111	1404	1	662	9392
3	1	666	7106	2	494	4088
4	2	222	2808	3	325	8784
5	2	777	8510	4	157	3480
6	3	333	4212	4	988	8176
7	3	888	9914	5	820	2872
8	4	444	5616	6	651	7568
9	5	000	1318	7	483	2264
10	5	555	7020	8	314	6960

1	0	595	6994	0	803	9893
2	1	191	3988	1	606	4150
3	1	787	0982	2	409	6225
4	2	382	7976	3	212	8300
5	2	978	4970	4	016	0375
6	3	574	1964	4	819	2450
7	4	169	8958	5	622	4525
8	4	765	5952	6	425	6600
9	5	361	2946	7	228	8675
10	5	956	9940	8	032	0750
1	0	634	3933	0	773	0105
2	1	268	7866	1	546	0210
3	1	903	1799	2	319	0315
4	2	537	5732	3	092	0430
5	3	171	2665	3	865	0125
6	3	806	3598	4	638	0630
7	4	440	7531	5	411	0735
8	5	075	1464	6	184	0840
9	5	709	5397	6	957	0945
10	6	343	9330	7	730	1050
1	0	671	5590	0	740	9512
2	1	343	1180	1	481	9024
3	2	014	5770	2	222	8536
4	2	686	2360	2	963	8048
5	3	357	7950	3	704	7560
6	4	029	3540	4	445	7072
7	4	700	9130	5	186	6584
8	5	372	4720	5	927	6096
9	6	044	0310	6	668	5608
10	6	715	5900	7	409	5120
1	0	707	1068	0	707	1068
2	1	414	2136	1	414	2136
3	2	121	3204	2	121	3204
4	2	828	4272	2	828	4272
5	3	535	5340	3	535	5340
6	4	242	6408	4	242	6408
7	4	949	7476	4	949	7476
8	5	656	8544	5	656	8544
9	6	363	9612	6	363	9612
10	7	071	0680	7	071	0680

1	0	017	4524	0	999	8477
2	0	034	9048	1	999	6954
3	0	052	3572	2	999	5431
4	0	069	8026	3	999	3908
5	0	087	2620	4	999	2385
6	0	104	7144	5	999	0862
7	0	122	1668	6	998	9339
8	0	139	6192	7	998	7816
9	0	157	0716	8	998	6293
10	0	174	5240	9	998	4770
1	0	034	8995	0	999	3908
2	0	069	7990	1	998	7816
3	0	104	6985	2	998	1724
4	0	139	5980	3	997	5632
5	0	174	4975	4	996	9540
6	0	209	3970	5	996	3448
7	0	244	2965	6	995	7356
8	0	279	1960	7	995	1264
9	0	314	0955	8	994	5172
10	0	348	9950	9	993	9080
1	0	052	3360	0	998	6295
2	0	104	6720	1	997	2590
3	0	157	0080	2	995	8885
4	0	209	3440	3	994	5180
5	0	261	6800	4	993	1475
6	0	314	0160	5	991	7770
7	0	366	3520	6	990	4065
8	0	418	6880	7	989	0360
9	0	471	0240	8	987	6655
10	0	523	3600	9	986	2950
1	0	069	7595	0	997	5640
2	0	139	5130	1	995	1280
3	0	209	2695	2	992	6920
4	0	279	0260	3	990	2560
5	0	348	7825	4	987	8200
6	0	418	5390	5	985	3840
7	0	488	2955	6	982	9480
8	0	558	0520	7	980	5120
9	0	527	8085	8	978	0760
10	0	607	5650	9	975	6400

1	0	087	1557	0	998	1947
2	0	174	3114	1	992	3894
3	0	261	4671	2	988	5841
4	0	348	6228	3	984	7788
5	0	435	7785	4	980	9735
6	0	522	9342	5	977	1682
7	0	610	0899	6	973	3629
8	0	697	2456	7	969	5576
9	0	784	4013	8	965	7523
10	0	871	5570	9	961	9470
1	0	104	5285	0	994	5219
2	0	209	0570	1	989	0438
3	0	313	5855	2	983	5657
4	0	418	1140	3	978	0876
5	0	522	6425	4	972	6095
6	0	627	1710	5	967	1314
7	0	731	6995	6	961	6533
8	0	836	2280	7	956	1752
9	0	940	7565	8	950	6971
10	1	045	2850	9	945	2190
1	0	121	8693	0	992	5461
2	0	243	7386	1	985	0922
3	0	365	6079	2	977	6383
4	0	487	4772	3	970	1844
5	0	609	3465	4	962	7305
6	0	731	2158	5	955	2766
7	0	853	0851	6	947	8227
8	0	974	9544	7	940	3688
9	1	096	8237	8	932	9149
10	1	218	6930	9	925	4610
1	0	139	1731	0	990	2681
2	0	278	3462	1	980	5362
3	0	417	5193	2	970	8043
4	0	556	6924	3	961	0724
5	0	695	8655	4	951	3405
6	0	835	0386	5	941	6086
7	0	974	2117	6	931	8767
8	1	113	3848	7	922	1448
9	1	252	5579	8	912	4129
10	1	391	7310	9	902	6810

1	0	156	4345	0	977	0383
2	0	312	8690	1	975	3766
3	0	469	3935	2	963	0649
4	0	625	7380	3	950	7532
5	0	782	1725	4	938	4415
6	0	938	6070	5	926	1298
7	1	094	0415	6	913	8181
8	1	251	4760	7	901	5064
9	1	407	9105	8	889	1947
10	1	564	3450	9	876	8820
1	0	173	6482	0	984	8078
2	0	347	2964	1	969	6156
3	0	520	9446	2	954	4234
4	0	694	5928	3	939	2312
5	0	868	2410	4	924	0390
6	1	041	8892	5	908	8468
7	1	215	1374	6	893	6546
8	1	389	1856	7	878	4624
9	1	562	8338	8	863	2702
10	1	736	4820	9	848	0780
1	0	190	8090	0	981	6272
2	0	381	6180	1	963	2544
3	0	572	4270	2	944	8816
4	0	763	2360	3	926	5088
5	0	954	0450	4	908	1360
6	1	144	8540	5	889	7632
7	1	335	6630	6	871	3904
8	1	526	4720	7	853	0176
9	1	717	1810	8	834	6448
10	1	908	0900	9	816	2720
1	0	207	9117	0	978	1476
2	0	413	8234	1	956	2952
3	0	629	7351	2	934	4428
4	0	831	6468	3	912	5904
5	1	039	9585	4	890	7380
6	1	247	4702	5	868	8856
7	1	455	3819	6	847	0332
8	1	663	2936	7	825	1808
9	1	871	2053	8	803	3284
10	2	079	1170	9	781	4760

1	0	224	9511	0	974	3760
2	0	449	9022	1	948	7400
3	0	674	8533	2	923	1100
4	0	899	8044	3	897	4800
5	1	124	7555	4	871	8500
6	1	349	7066	5	846	2200
7	1	574	6577	6	820	5900
8	1	799	6088	7	794	9600
9	2	024	5599	8	769	3300
10	2	249	5110	9	743	7000
1	0	241	9319	0	970	2957
2	0	483	8438	1	940	5914
3	0	725	7657	2	910	8871
4	0	967	6876	3	881	1828
5	1	209	6095	4	851	4785
6	1	451	5314	5	821	7742
7	1	693	4533	6	792	0699
8	1	935	3752	7	762	3656
9	2	177	2971	8	732	6613
10	2	419	2190	9	702	9570
1	0	258	8190	0	965	9258
2	0	517	6380	1	931	8516
3	0	776	4570	2	897	7774
4	1	035	3760	3	863	7032
5	1	294	0950	4	829	6290
6	1	552	9140	5	795	5548
7	1	711	7330	6	761	4806
8	1	970	5520	7	727	4054
9	2	329	3710	8	693	3322
10	2	588	1900	9	659	2580
1	0	275	6373	0	961	2617
2	0	551	2746	1	922	5234
3	0	826	9119	2	883	7851
4	1	102	5492	3	845	0468
5	1	378	1865	4	806	3085
6	1	653	8238	5	767	5702
7	1	929	4611	6	728	8319
8	2	205	0984	7	690	0936
9	2	480	7357	8	651	3553
10	2	756	3730	9	612	6170

1	0	192	3717	0	956	3048
2	0	584	7434	1	912	6096
3	0	877	1151	2	868	9144
4	1	169	4868	3	825	2192
5	1	461	8585	4	781	5240
6	1	754	2302	5	737	8288
7	2	046	6019	6	694	1336
8	2	338	9736	7	650	4384
9	2	631	3453	8	606	7432
10	2	923	7170	9	563	0480
1	0	309	0170	0	951	0465
2	0	618	0340	1	902	1130
3	0	927	0510	2	853	1695
4	1	236	0680	3	804	2260
5	1	545	0850	4	755	2825
6	1	854	1020	5	705	3390
7	2	193	1190	6	657	3955
8	2	472	1360	7	608	4520
9	2	781	1530	8	559	5085
10	3	090	1700	9	510	5650
1	0	325	5682	0	245	5186
2	0	651	1364	1	891	0372
3	0	976	7046	2	836	5558
4	1	302	2728	3	782	0744
5	1	627	8410	4	727	5930
6	1	953	4092	5	673	1116
7	2	278	9774	6	618	6302
8	2	604	5456	7	564	2488
9	2	930	1138	8	509	6674
10	3	255	6820	9	455	1860
1	0	342	0201	0	939	6926
2	0	684	0402	1	879	3852
3	1	026	0603	2	819	0778
4	1	368	0804	3	758	7704
5	1	710	1005	4	698	4630
6	2	052	1206	5	638	1556
7	2	394	1407	6	577	8482
8	2	736	1608	7	517	5408
9	3	078	1809	8	458	2334
10	3	490	2010	9	396	9260

1	0	358	3679	0	933	5804
2	0	716	7358	1	867	1608
3	1	075	1037	2	800	7412
4	1	433	4716	3	734	3216
5	1	791	8395	4	667	9020
6	1	150	2074	5	601	4824
7	1	508	5753	6	535	0628
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33	6292336	66	5691610	99	5124923
				600	5108255

601	5091601	34	4557063	67	4056155
2	5074977	35	4541303	68	4034669
3	5058379	36	4525566	69	4019711
4	5041809	37	4509854	70	4004775
5	5025268	38	4494169	71	3989851
6	5008747	39	4478502	72	3974969
7	4992594	40	4462868	73	3960098
8	4979603	41	4447256	74	3945250
9	4959352	42	4431668	75	3930423
10	4942963	43	4416093	76	3915622
11	4926582	44	4400568	77	3900840
12	4910228	45	4385050	78	3886079
13	4893902	46	4369558	79	3871335
14	4877600	47	4357339	80	3872334
15	4861380	48	4338644	81	3841929
16	4845082	49	4323224	82	3827255
17	4828860	50	4307830	83	3812604
18	4812667	51	4292456	84	3797973
19	4796499	52	4277106	85	3783362
20	4780357	53	4261781	86	3768775
21	4764082	54	4246478	87	3754209
22	4748152	55	4231199	88	3739664
23	4732087	56	4215944	89	3725140
24	4716050	57	4200709	90	3710636
25	4700035	58	4185502	91	3696153
26	4685147	59	4170315	92	3681691
27	4668086	60	4155153	93	3667251
28	4652151	61	4140014	94	3652831
29	4636239	62	4124942	95	3638433
30	4620352	63	4109729	96	3624055
31	4604493	64	4094733	97	3609697
32	4588656	65	4079674	98	3595360
33	4572847	66	4064655	99	3581045
				700	3566750

701	3552473	34	3092360	67	2652683
2	3538219	35	3078847	68	2639655
3	3523983	36	3065251	69	2626643
4	3509721	37	3053030	70	2613646
5	3495573	38	3038113	71	2600668
6	3481400	39	3024542	72	2587706
7	3467246	40	3011049	73	2574762
8	3453111	41	2997545	74	2562375
9	3438997	42	2984058	75	2548921
10	3424903	43	2970592	76	2536028
11	3410828	44	2957141	77	2523149
12	3396773	45	2943710	78	2510288
13	3382737	46	2930297	79	2497441
14	3368724	47	2916901	80	2484612
15	3354727	48	2903520	81	2471791
16	3340749	49	2890161	82	2459005
17	3326793	50	2876820	83	2446225
18	3312856	51	2863496	84	2433573
19	3298938	52	2850188	85	2420714
20	3285039	53	2836899	86	2407984
21	3271159	54	2823629	87	2395268
22	3257301	55	2810373	88	2382571
23	3243463	56	2797662	89	2369889
24	3229626	57	2783920	90	2356223
25	3215834	58	2770718	91	2344573
26	3202052	59	2757534	92	2331937
27	3188288	60	2744378	93	2319320
28	3174540	61	2731219	94	2306720
29	3160967	62	2718087	95	2294133
30	3147108	63	2704970	96	2281560
31	3133418	64	2691873	97	2269694
32	3119746	65	2678793	98	2256467
33	3106094	66	2665730	99	2243943
				800	2231492

1	2198143	34	1815220	67	1417164
2	2206465	35	1803236	68	1415635
3	2194005	36	1791266	69	1404121
4	2181560	37	1779312	70	1392618
5	2169129	38	1767372	71	1381134
6	2156715	39	1755446	72	1369659
7	2144316	40	1743514	73	1358197
8	2131932	41	1731636	74	1346749
9	2120800	42	1719754	75	1335314
10	2107210	43	1707884	76	1323892
11	2094871	44	1696027	77	1312472
12	2082549	45	1684186	78	1301086
13	2070242	46	1672359	79	1289703
14	2057949	47	1660545	80	1278261
15	2045672	48	1648746	81	1266977
16	2033409	49	1636953	82	1255636
17	2021148	50	1625190	83	1244308
18	2008929	51	1613431	84	1232982
19	1996710	52	1601689	85	1221677
20	1984509	53	1589957	86	1210381
21	1972321	54	1578241	87	1199103
22	1960029	55	1566538	88	1187853
23	1947989	56	1554849	89	1176579
24	1935846	57	1544342	90	1165339
25	1923720	58	1531511	91	1154108
26	1911603	59	1519865	92	1142892
27	1899506	60	1508229	93	1131688
28	1887420	61	1496608	94	1120495
29	1875351	62	1485001	95	1109315
30	1863297	63	1473408	96	1098147
31	1851254	64	1461826	97	1086994
32	1839227	65	1450258	98	1075854
33	1827217	66	1438704	99	1064722
				100	1053605

901	1042501	34	682790	67	385568
2	1031407	35	672085	68	385232
3	1020326	36	661398	69	384907
4	1009259	37	650718	70	304592
5	998204	38	640054	71	294288
6	987160	39	629398	72	283994
7	976129	40	618753	73	273715
8	965111	41	608122	74	263440
9	954101	42	597497	75	253178
10	943107	43	586890	76	242928
11	932124	44	576288	77	232686
12	921152	45	565704	78	222457
13	910192	46	555128	79	212237
14	899260	47	544560	80	202027
15	888310	48	534010	81	191828
16	877389	49	523464	82	181640
17	866484	50	512934	83	171461
18	855579	51	502413	84	161276
19	844694	52	491902	85	151136
20	833813	53	481404	86	140991
21	822953	54	470915	87	130852
22	812098	55	460440	88	120727
23	801262	56	449974	89	110610
24	790432	57	439518	90	100504
25	779615	58	429076	91	90407
26	768811	59	418643	92	80406
27	758016	60	408524	93	70247
28	747236	61	397808	94	60181
29	736464	62	387408	95	50125
30	725707	63	377019	96	40082
31	714958	64	366637	97	30044
32	704223	65	356272	98	20020
33	693501	66	345915	99	10005
				1000	0

0.Degrees.

1.Degrees.

M.	Equall P.	M.		M.	Equall P.	M.	
1	10000	31	10000	1	610013	31	910073
2	20000	32	20000	2	20014	32	20076
3	30000	33	30000	3	30015	33	30079
4	40000	34	40000	4	40016	34	40082
5	50000	35	50000	5	50017	35	50085
6	60000	36	60000	6	60018	36	60088
7	70000	37	70000	7	70019	37	70091
8	80000	38	80000	8	80020	38	80095
9	90000	39	90000	9	90022	39	90099
10	100000	40	400000	10	700024	40	1000103
11	10000	41	10000	11	10026	41	010107
12	20000	42	20000	12	20028	42	020111
13	30000	43	30000	13	30030	43	030115
14	40000	44	40000	14	40032	44	040119
15	50000	45	50000	15	50034	45	050123
16	60000	46	60000	16	60036	46	060127
17	70000	47	70000	17	70038	47	070131
18	80000	48	80000	18	80040	48	080135
19	60000	49	90001	19	90042	49	090140
20	200000	50	500002	20	800044	50	1100145
21	10000	51	10003	21	10046	51	110150
22	20000	52	10004	22	10058	52	120155
23	30000	53	30005	23	30050	53	130160
24	40000	54	40006	24	40052	54	140165
25	50000	55	50007	25	50055	55	150170
26	60000	56	60008	26	60058	56	160175
27	70000	57	70009	27	70061	57	170180
28	80000	58	80010	28	80064	58	180185
29	90000	59	90011	29	90067	59	190190
30	300000	60	600012	30	900070	60	1200196

2. Degrees.

3. Degrees.

M.	Equall P.	M.		M.	Equall P.	M.	
1	1210202	31	1510425	1	1810762	31	2111238
2	1220208	32	1520434	2	1820776	32	2121257
3	1230214	33	1530443	3	1830790	33	2131276
4	1240220	34	1540453	4	1840804	34	2141295
5	1250226	35	1550463	5	1850818	35	2151314
6	1260232	36	1560473	6	1860832	36	2161333
7	1270238	37	1570483	7	1870846	37	2171352
8	1280244	38	1580493	8	1880860	38	2181372
9	1290251	39	1590503	9	1890875	39	2191392
10	1300258	40	1600513	10	1900890	40	2201412
11	1310265	41	1610523	11	1910905	41	2211432
12	1320272	42	1620534	12	1920920	42	2221452
13	1330279	43	1630545	13	1930935	43	2231473
14	1340286	44	1640556	14	1940950	44	2241494
15	1350293	45	1650567	15	1950966	45	2251515
16	1360300	46	1660578	16	1960982	46	2261536
17	1370307	47	1670589	17	1970998	47	2271557
18	1380315	48	1680600	18	1981014	48	2281579
19	1390323	49	1690613	19	1991030	49	2291601
20	1400331	50	1700624	20	2001046	50	2301623
21	1410339	51	1710636	21	2011063	51	2311645
22	1420347	52	1720648	22	2021080	52	2321667
23	1430355	53	1730660	23	2031097	53	2331690
24	1440363	54	1740672	24	2041114	54	2341713
25	1450371	55	1750684	25	2051131	55	2351736
26	1460380	56	1760697	26	2061148	56	2361759
27	1470389	57	1770710	27	2071166	57	2371782
28	1480398	58	1780723	28	2081184	58	2381806
29	1490407	59	1790736	29	2091202	59	2391830
30	1500416	60	1800749	30	2101220	60	2401854

4 Degrees.

5. Degrees.

M.	Equall P.	M.		M.	Equall P.	M.	
1	2411878	31	2712702	1	3013732	31	3314994
2	2421902	32	2722733	2	3023770	32	3325040
3	2431927	33	2732764	3	3033808	33	3335087
4	2441952	34	2742795	4	3043847	34	3345134
5	2451977	35	2752827	5	3053886	35	3355181
6	2462002	36	2762859	6	3063925	36	3365228
7	2472027	37	2772891	7	3073965	37	3375276
8	2482053	38	2782923	8	3084005	38	3385324
9	2492079	39	2792956	9	3094045	39	3395372
10	2502105	40	2802989	10	3104085	40	3405421
11	2512131	41	2813022	11	3114126	41	3415470
12	2522157	42	2823055	12	3124167	42	3425519
13	2532184	43	2833088	13	3134208	43	3435568
14	2542211	44	2843122	14	3144249	44	3445618
15	2552238	45	2853156	15	3154291	45	3455668
16	2562265	46	2863190	16	3164333	46	3465718
17	2572293	47	2873224	17	3174375	47	3475769
18	2582321	48	2883259	18	3184417	48	3485820
19	2592349	49	2893294	19	3194460	49	3495871
20	2602377	50	2903329	20	3204503	50	3505923
21	2612405	51	2913364	21	3214546	51	3515975
22	2622434	52	2923400	22	3224590	52	3526027
23	2632463	53	2933436	23	3234634	53	3536079
24	2642492	54	2943472	24	3244678	54	3546132
25	2652521	55	2953508	25	3254722	55	3556185
26	2662551	56	2963545	26	3264767	56	3566238
27	2672581	57	2973582	27	3274812	57	3576292
28	2682611	58	2983619	28	3284857	58	3586346
29	2692641	59	2993656	29	3294902	59	3596400
30	2702671	60	3003694	30	3304948	60	3606455

6. Degrees.

7. Degrees.

M.	Equal P.	M.	Equal P.	M.	Equal P.	M.	Equal P.
1	3616510	31	3918306	1	4220403	31	4522823
2	3626565	32	3928371	2	4230478	32	4532910
3	3636621	33	3938436	3	4240554	33	4542997
4	3646677	34	3948502	4	4250630	34	4553084
5	3656733	35	3958568	5	4260706	35	4563172
6	3666789	36	3968634	6	4270783	36	4573260
7	3676846	37	3978701	7	4280860	37	4583349
8	3686903	38	3988768	8	4290938	38	4593438
9	3696960	39	3998835	9	4301016	39	4603527
10	3707018	40	4008903	10	4311094	40	4613617
11	3717076	41	4018971	11	4321173	41	4623707
12	3727134	42	4029039	12	4331252	42	4633797
13	3737193	43	4039108	13	4341331	43	4643888
14	3747252	44	4049177	14	4351411	44	4653979
15	3757311	45	4059246	15	4361491	45	4664071
16	3767371	46	4069316	16	4371571	46	4674163
17	3777431	47	4079386	17	4381652	47	4684255
18	3787491	48	4089456	18	4391733	48	4694348
19	3797552	49	4099527	19	4401815	49	4704441
20	3807613	50	4109598	20	4411897	50	4714535
21	3817674	51	4119669	21	4421979	51	4724629
22	3827736	52	4129741	22	4432062	52	4734724
23	3837798	53	4139813	23	4442145	53	4744819
24	3847860	54	4149885	24	4452228	54	4754914
25	3857923	55	4159958	25	4462312	55	4765010
26	3867986	56	4170031	26	4472396	56	4775106
27	3878049	57	4180105	27	4482481	57	4785203
28	3888113	58	4190179	28	4492566	58	4795300
29	3898177	59	4200253	29	4502651	59	4805397
30	3908241	60	4210328	30	4512737	60	4815495

8. Degrees.

.239720 C. 11

9. Degrees.

.239720 C. 11

M.	Equal P.	M.		M.	Equal P.	M.	
1	4825593	31	5128736	1	5432275	31	5736236
2	4835692	32	5138847	2	5442400	32	5746376
3	4845791	33	5148959	3	5452526	33	5756516
4	4855890	34	5159071	4	5462652	34	5766657
5	4865990	35	5169184	5	5472778	35	5776798
6	4876090	36	5179297	6	5482905	36	5786940
7	4886191	37	5189411	7	5493032	37	5797082
8	4896292	38	5199525	8	5503160	38	5807225
9	4906394	39	5209640	9	5513288	39	5817368
10	4916496	40	5219755	10	5523417	40	5827512
11	4926598	41	5229870	11	5533546	41	5837656
12	4936701	42	5239986	12	5543676	42	5847801
13	4946804	43	5250102	13	5553806	43	5857946
14	4956908	44	5260219	14	5563937	44	5868092
15	4967012	45	5270336	15	5574068	45	5878238
16	4977116	46	5280454	16	5584200	46	5888385
17	4987221	47	5290572	17	5594332	47	5898532
18	4997326	48	5300691	18	5604465	48	5908680
19	5007432	49	5310810	19	5614598	49	5918828
20	5017538	50	5320930	20	5624732	50	5928977
21	5027645	51	5331050	21	5634866	51	5939126
22	5037752	52	5341170	22	5645001	52	5949276
23	5047860	53	5351291	23	5655136	53	5959426
24	5057968	54	5361412	24	5665272	54	5969577
25	5068076	55	5371534	25	5675408	55	5979728
26	5078185	56	5381656	26	5685545	56	5989880
27	5088294	57	5391779	27	5695682	57	6000032
28	5098404	58	5401902	28	5705820	58	6010185
29	5108514	59	5412026	29	5715958	59	6020338
30	5118625	60	5422150	30	5726097	60	6030492

12. Degrees.

13. Degrees.

M.	Equall P.	M.		M.	Equall P.	M.	
1	7263216	31	7570220	1	7877821	31	8186044
2	7273440	32	7580464	2	7888085	32	8196329
3	7283665	33	7590708	3	7898350	33	8206615
4	7293890	34	7600953	4	7908615	34	8216902
5	7304116	35	7611199	5	7918881	35	8227189
6	7314343	36	7621445	6	7929148	36	8237477
7	7324570	37	7631692	7	7939415	37	8247766
8	7334798	38	7641940	8	7949683	38	8258055
9	7345027	39	7652188	9	7959952	39	8268345
10	7355256	40	7662437	10	7970221	40	8278636
11	7365486	41	7672687	11	7980491	41	8288928
12	7375717	42	7682937	12	7990762	42	8299220
13	7385948	43	7693188	13	8001034	43	8309513
14	7396180	44	7703440	14	8011306	44	8319807
15	7406412	45	7713692	15	8021579	45	8330102
16	7416645	46	7723945	16	8031853	46	8340397
17	7426879	47	7734199	17	8042127	47	8350693
18	7437113	48	7744453	18	8052402	48	8360990
19	7447348	49	7754708	19	8062678	49	8371287
20	7457584	50	7764964	20	8072955	50	8381585
21	7467820	51	7775220	21	8083232	51	8391884
22	7478057	52	7785477	22	8093510	52	8402184
23	7488295	53	7795735	23	8103789	53	8412484
24	7498533	54	7805993	24	8114068	54	8422785
25	7508772	55	7816252	25	8124348	55	8433087
26	7519012	56	7826512	26	8134629	56	8443390
27	7529252	57	7836772	27	8144911	57	8453693
28	7539493	58	7847033	28	8155193	58	8463997
29	7549735	59	7857295	29	8165476	59	8474302
30	7559977	60	7867558	30	8175760	60	8484608

14. Degrees.

15. Degrees.

M.	Equall P.	M.	M.	Equall P.	M.		
1	8494914	31	8804458	1	9114270	31	9425674
2	8505221	32	8814788	2	9125056	32	9436053
3	8515529	33	8825119	3	9135411	33	9446432
4	8525838	34	8835451	4	9145766	34	9456812
5	8536147	35	8845783	5	9156122	35	9467193
6	8546457	36	8856116	6	9166479	36	9477575
7	8556768	37	8866450	7	9176837	37	9487958
8	8567080	38	8876785	8	9187196	38	9498342
9	8577392	39	8887121	9	9197556	39	9508726
10	8587705	40	8897457	10	9207916	40	9519111
11	8598019	41	8907794	11	9218277	41	9529497
12	8608334	42	8918132	12	9228639	42	9539884
13	8618649	43	8928471	13	9239003	43	9550272
14	8628965	44	8938810	14	9249366	44	9560661
15	8639282	45	8949150	15	9259730	45	9571051
16	8649600	46	8959491	16	9270095	46	9581441
17	8659918	47	8969833	17	9280461	47	9591832
18	8670237	48	8980176	18	9290828	48	9602224
19	8680557	49	8990519	19	9301196	49	9612617
20	8690878	50	9000863	20	9311565	50	9623011
21	8701200	51	9011208	21	9321934	51	9633406
22	8711522	52	9021554	22	9332304	52	9643802
23	8721845	53	9031901	23	9342675	53	9654198
24	8732169	54	9042248	24	9353047	54	9664595
25	8742494	55	9052596	25	9363420	55	9674993
26	8752819	56	9062945	26	9373794	56	9685392
27	8763145	57	9073295	27	9384168	57	9695792
28	8773472	58	9083645	28	9394543	58	9706193
29	8783800	59	9093997	29	9404919	59	9716595
30	8794129	60	9104349	30	9415296	60	9726997

16. Degrees.

17. Degrees.

M.	Equall P.	M.		M.	Equall P.	M.	
1	9737400	31	10049910	1	10363229	31	10677387
2	9747804	2	60341	2	73687	2	87874
3	9758209	3	70773	3	84146	3	98362
4	9768615	4	81206	4	94606	4	10708851
5	9779022	35	91639	5	10405067	35	19341
6	9789430	6	10102073	6	15529	6	29832
7	9799839	7	12508	7	25992	7	40324
8	9810248	8	22944	8	36456	8	50817
9	9820658	9	33381	9	46921	9	61310
10	9831069	40	43819	10	57387	40	71804
1	9841481	1	54258	1	67854	1	82299
2	9851894	2	64698	2	78322	2	92795
3	9862308	3	75139	3	88791	3	10803292
4	9872723	4	85581	4	99261	4	13790
15	9883139	45	96024	15	10509731	45	24289
6	9893556	6	10206467	6	20202	6	34789
7	9903973	7	16911	7	30574	7	45290
8	9914391	8	27356	8	41147	8	55792
9	9924810	9	37802	9	51621	9	66295
20	9935230	50	48249	20	62096	50	76799
1	9945651	1	58697	1	72572	1	89304
2	9956073	2	69146	2	83049	2	97810
3	9966496	3	79596	3	93527	3	10908317
4	9976920	4	90047	4	10504006	4	18825
25	9987345	55	10300499	25	14486	55	29334
6	9997770	6	10952	6	24957	6	39844
7	10008196	7	21406	7	35449	7	50355
8	18623	8	31861	8	45932	8	60867
9	29051	9	42316	9	56416	9	71380
30	39480	60	52772	30	66901	60	81894

18. Degrees.

19. Degrees.

M.	Equall P.	M.		M.	Equall P.	M.	
1	10992409	31	11308124	1	11625173	31	11942974
2	11002925	2	18870	2	35751	2	53584
3	13442	3	29418	3	46330	3	64195
4	23960	4	39967	4	56910	4	74807
5	34479	5	50517	5	67491	5	85420
6	44999	6	61068	6	78073	6	96035
7	55520	7	71620	7	88656	7	12006651
8	66042	8	82173	8	99240	8	17268
9	76565	9	92727	9	11709825	9	27886
10	87089	40	11403282	10	20411	40	38505
1	97614	1	13838	1	30998	1	49125
2	11108140	2	24395	2	41586	2	59746
3	18667	3	34953	3	52176	3	70368
4	29195	4	45112	4	62767	4	89991
5	39724	5	56072	5	73359	5	91616
6	50254	6	66633	6	83952	6	12102242
7	60785	7	77195	7	94546	7	12869
8	71317	8	87758	8	11805141	8	23497
9	81850	9	98322	9	15737	9	34126
20	92384	50	11508887	20	26334	50	44756
1	11202919	1	19453	1	36932	1	55387
2	13455	2	30020	2	47531	2	66019
3	23992	3	40588	3	58131	3	76652
4	34530	4	51157	4	68732	4	87287
5	45069	5	61727	5	79335	5	97923
6	55609	6	72298	6	89939	6	12208560
7	66150	7	82871	7	11900544	7	19198
8	76692	8	93445	8	11150	8	29837
9	87235	9	11604020	9	21757	9	40477
30	97779	60	14596	30	32365	60	51118

20. Degrees.

12. Degrees.

M.	Equall P.	M.		M.	Equall P.	M.	
1	12261760	31	12581562	1	12902411	31	13224338
2	72404	2	92240	2	13124	2	35088
3	83049	3	12602919	3	23839	3	45839
4	93695	4	13599	4	34555	4	56591
5	12304342	5	24280	5	45272	5	67345
6	14990	6	34963	6	55990	6	78100
7	25639	7	45647	7	66709	7	88856
8	36289	8	56332	8	77430	8	99613
9	46940	9	67018	9	88152	9	13310371
10	57593	40	77705	10	98875	40	21131
1	68247	1	88393	1	13009599	1	31892
2	78902	2	99083	2	20324	2	42654
3	89558	3	12709774	3	31051	3	53417
4	12400215	4	20466	4	41779	4	64182
5	10873	5	31159	5	52508	5	74948
6	21532	6	41853	6	63238	6	85715
7	32193	7	52549	7	73969	7	96483
8	42855	8	63246	8	84702	8	13407253
9	53518	9	73944	9	95436	9	18024
20	64182	50	84643	20	13106171	50	28796
1	74847	1	95343	1	16907	1	39569
2	85513	2	12806044	2	27645	2	50344
3	96180	3	16747	3	38384	3	61120
4	12506849	4	27451	4	49124	4	71897
5	17519	5	38156	5	59865	5	82676
6	28190	6	48862	6	70607	6	93456
7	38862	7	59569	7	81351	7	13504237
8	49535	8	70278	8	92096	8	15019
9	60209	9	80988	9	13202842	9	25803
30	70885	60	91699	30	13589	60	36588

22. Degrees.

M.	Equall P.	M.
1	13547374	31
2	58161	2
3	68950	3
4	79740	4
5	90531	5
6	13601323	6
7	12117	7
8	22912	8
9	33708	9
10	44506	10
11	55305	11
12	66105	12
13	76906	13
14	87709	14
15	98513	15
16	13709318	16
17	20125	17
18	30933	18
19	41742	19
20	52552	20
21	63364	21
22	74177	22
23	84991	23
24	95807	24
25	13806624	25
26	17442	26
27	28262	27
28	39083	28
29	49905	29
30	60728	30

23. Degrees.

M.	Equall P.	M.
1	14196906	31
2	14207772	2
3	18639	3
4	29507	4
5	40377	5
6	51248	6
7	62121	7
8	72995	8
9	83870	9
10	94747	10
11	14305625	11
12	16504	12
13	27385	13
14	38267	14
15	49150	15
16	60035	16
17	70921	17
18	81808	18
19	92697	19
20	14403587	20
21	14479	21
22	25372	22
23	36266	23
24	47162	24
25	58059	25
26	68957	26
27	79857	27
28	90758	28
29	14501661	29
30	12565	30

14523470
34377
45285
56194
67105
78017
88931
99846
14610762
21680
32599
43520
54442
65365
76290
87216
98144
14709073
20003
30935
41868
52803
63739
74676
85615
96555
14807497
18440
29384
40330

24. Degrees.

25. Degrees.

M.	Equall P.	M.		M.	Equall P.	M.	
1	14851277	31	15180362	1	15510759	31	15842504
2	62226	2	91354	2	21795	2	53586
3	73176	3	15202347	3	32833	3	64669
4	84128	4	13342	4	43872	4	75754
5	95081	35	24338	5	54913	5	86840
6	14906035	6	35336	6	65955	6	97928
7	16991	7	46335	7	76999	7	15909018
8	27948	8	57336	8	88044	8	20109
9	38907	9	68338	9	99091	9	31202
10	49867	40	79342	10	15610139	40	42296
11	60829	1	90347	11	21189	1	53392
12	71792	2	15301354	12	32240	2	64489
13	82756	3	12362	13	43293	3	75588
14	93722	4	23372	14	54347	4	86688
15	15004689	45	34383	15	65403	5	97790
16	15658	6	45395	16	76460	6	16008894
17	26628	7	56409	17	87519	7	19999
18	37600	8	67424	18	98579	8	31106
19	48573	9	78441	19	15709641	9	42214
20	59547	50	89459	20	20704	50	53324
1	70523	1	15400479	1	31769	1	64435
2	81500	2	11500	2	42836	2	75548
3	92479	3	22523	3	53304	3	86663
4	15103459	4	33547	4	64974	4	97779
25	14441	55	44573	5	76045	5	16108897
26	25424	6	55600	6	87118	6	20016
27	36409	7	66629	7	98192	7	31137
28	47395	8	77659	8	15809268	8	42259
29	58383	9	88691	9	20345	9	53383
30	69372	60	99724	30	31424	60	64509

26. Degrees.

M.	Equall P.	M.
1	16175636	31
2	86765	2
3	97895	3
4	16209027	4
5	20160	5
6	31295	6
7	42432	7
8	53570	8
9	64710	9
10	75851	40
1	86994	1
2	98139	2
3	16309285	3
4	20433	4
5	31582	5
6	42733	6
7	53886	7
8	65040	8
9	76196	9
20	87353	50
1	98512	1
2	16409673	2
3	20835	3
4	31999	4
5	43164	5
6	54331	6
7	65500	7
8	76670	8
9	87842	9
30	99016	60

27. Degrees.

M.	Equall P.	M.
1	16846206	31
2	57432	2
3	68660	3
4	79839	4
5	91120	5
6	16902353	6
7	13587	7
8	24823	8
9	36061	9
10	47300	40
1	58541	1
2	69784	2
3	81029	3
4	92275	4
5	17003523	5
6	14773	6
7	26024	7
8	37277	8
9	48532	9
20	59788	50
1	71046	1
2	82306	2
3	93567	3
4	17104830	4
5	16095	5
6	27362	6
7	38630	7
8	49900	8
9	61172	9
30	72445	60

17183720
94997
17206275
17555
28837
40121
51406
62693
73982
85272
96564
17307858
19154
30451
41750
53051
64354
75658
86964
98272
17409581
20892
32205
43520
54836
66154
77474
88796
17500119
11444

28. Degrees.

29. Degrees.

M.	Equal P.	M.		M.	Equal P.	M.	
1	17522771	31	17863401	1	18205652	31	18549564
2	34100	2	74783	2	17089	2	61057
3	45430	3	86167	3	28528	3	72552
4	56762	4	97553	4	39968	4	84049
5	68096	5	17908940	5	51410	5	95548
6	79432	6	20329	6	62854	6	18607048
7	90769	7	31720	7	74300	7	18550
8	17602108	8	43113	8	85748	8	30054
9	13449	9	54508	9	97198	9	41560
10	24792	40	65964	10	18308650	40	53068
1	36137	1	77302	1	20103	1	64578
2	47483	2	88702	2	31558	2	76090
3	58831	3	18000104	3	43015	3	87604
4	70181	4	11508	4	54474	4	99120
5	81533	5	22914	5	65935	5	18710638
6	92886	6	34321	6	77398	6	22158
7	17704241	7	45730	7	88863	7	33679
8	15598	8	57141	8	18400329	8	45202
9	26957	9	68554	9	11797	9	56727
20	38318	50	79969	20	23267	50	68254
1	49680	1	91386	1	34739	1	79783
2	61044	2	18102804	2	46213	2	91314
3	72410	3	14224	3	57689	3	18802847
4	83778	4	25646	4	69167	4	14382
5	95147	5	37070	5	80647	5	25919
6	17806518	6	48496	6	92129	6	37458
7	17891	7	59924	7	18503612	7	48999
8	29266	8	71353	8	15097	8	60542
9	40643	9	82784	9	26584	9	72087
30	62021	60	94217	30	38073	60	83634

30. Degrees.

31. Degrees.

32. Degrees.

33. Degrees.

M.	Equal P.	M.	Equal P.	M.	Equal P.	M.	Equal P.
1	18895182	31	19242545	1	19591698	31	19942691
2	18906732	2	54154	2	19603368	2	54423
3	18918284	3	65765	3	15040	3	66157
4	29838	4	77378	4	26714	4	77893
5	41394	5	88993	5	38390	5	89631
6	52952	6	19300610	6	50068	6	20001371
7	64512	7	12229	7	61748	7	13113
8	76074	8	23850	8	73430	8	24858
9	87638	9	35473	9	85114	9	36605
10	99204	10	47098	10	96800	10	48354
11	19010772	11	58725	11	19708488	11	60105
12	22342	12	70354	12	20178	12	71858
13	33914	13	81985	13	31870	13	83613
14	45488	14	93618	14	43565	14	95370
15	57064	15	19405253	15	55262	15	20107129
16	68642	16	16890	16	66961	16	18890
17	80322	17	28529	17	78662	17	30654
18	91804	18	40170	18	90365	18	42420
19	19103388	19	51814	19	19802070	19	54188
20	14974	20	63460	20	13777	20	65958
1	26562	1	75108	1	25486	1	77730
2	38152	2	86758	2	37192	2	89504
3	49744	3	98410	3	48910	3	20201280
4	61338	4	19510064	4	60625	4	13058
5	72933	5	21720	5	72342	5	24839
6	84530	6	33378	6	84061	6	36622
7	96129	7	45038	7	95783	7	48437
8	19207730	8	56700	8	19907507	8	60194
9	19333	9	68364	9	19333	9	71983
10	30938	10	80039	10	30961	10	83774

32. Degrees.

2551230.71

33. Degrees.

2551230.71

M.	Equall P.	M.	Equall P.	M.	Equall P.	M.	Equall P.
1	10295567	31	20650376	1	21007164	31	21361983
2	10307363	2	52237	2	00019092	2	00077979
3	19161	3	74100	3	11210123	3	01189977
4	30961	4	85965	4	42954	4	21401978
5	42763	35	97832	5	54888	35	13981
6	54567	6	20709702	6	66825	6	25986
7	66373	7	21574	7	78764	7	37994
8	78181	8	33448	8	90705	8	50094
9	89992	9	45324	9	21102648	9	62016
10	20401805	40	57202	10	14594	40	74031
1	13620	1	69083	1	26542	1	86048
2	25437	2	80966	2	38492	2	98067
3	37256	3	92851	3	50445	3	21510089
4	49077	4	20804738	4	62400	4	82113
15	60901	45	16628	15	74357	45	34139
6	72727	6	28520	6	86316	6	46168
7	84555	7	40414	7	98278	7	58199
8	96385	8	52310	8	21210242	8	70232
9	20508217	9	64208	9	32208	9	82268
20	20052	50	76109	20	34177	50	94306
1	31889	1	88012	1	46148	1	21006346
2	43728	2	99917	2	58121	2	318389
3	55569	3	20911824	3	70096	3	430434
4	67412	4	23734	4	82074	4	542482
25	79257	55	35646	25	94054	55	654532
6	91105	6	47560	6	24306036	6	766584
7	20602955	7	59476	7	36018021	7	878639
8	14807	8	71395	8	480008	8	990696
9	26661	9	83316	9	5941997	9	21702755
30	38517	60	95239	30	7153989	60	3148178

34 Degrees.

34 Degrees.

35 Degrees.

35 Degrees.

M.	Equall P.	M.	Equall P.	M.	Equall P.	M.	Equall P.
1	21716881	34	22087913	1	22455132	31	22822591
2	21738947	35	22102051	2	22467344	32	22834879
3	21751016	36	22114192	3	22479559	33	22847169
4	21763087	37	22126335	4	22491776	34	22859462
5	21775161	38	22138481	5	22503996	35	22871758
6	21787237	39	22150629	6	22516218	36	22884055
7	21799315	40	22162779	7	22528443	37	22896357
8	21811396	41	22174932	8	22540670	38	22908660
9	21823479	42	22187087	9	22552900	39	22920966
10	21835564	43	22199245	10	22565132	40	22933274
11	21847652	44	22211405	11	22577367	41	22945582
12	21859742	45	22223568	12	22589604	42	22957899
13	21871835	46	22235733	13	22601844	43	22970215
14	21883930	47	22247901	14	22614086	44	22982534
15	21896027	48	22260071	15	22626331	45	22994855
16	21908127	49	22272244	16	22638578	46	23007179
17	21920229	50	22284419	17	22650828	47	23019505
18	21932334	51	22296597	18	22663080	48	23031834
19	21944441	52	22308777	19	22675335	49	23044166
20	21956550	53	22320959	20	22687592	50	23056500
21	21968661	54	22333144	21	22699852	51	23068837
22	21980776	55	22345331	22	22712114	52	23081176
23	21992893	56	22357521	23	22724379	53	23093518
24	22005012	57	22369712	24	22736647	54	23105863
25	22017133	58	22381905	25	22748917	55	23118210
26	22029257	59	22394100	26	22761190	56	23130560
27	22041385	60	22406305	27	22773465	57	23142912
28	22053512	61	22418507	28	22785743	58	23155267
29	22065643	62	22430712	29	22798023	59	23167625
30	22077777	63	22442919	30	22810306	60	23179985

36. Degrees.

37. Degrees.

M.	Equall P.	M.		M.	Equall P.	M.	
1	23192348	31	23564459	1	23938983	31	24315979
2	23204713	2	76904	2	51509	2	28589
3	17081	3	89352	3	64038	3	41202
4	29452	4	23601802	4	76570	4	53817
5	41825	5	14255	5	89105	5	66435
6	54201	6	26711	6	24001642	6	79056
7	66580	7	39162	7	14182	7	91680
8	78961	8	51630	8	26725	8	24404307
9	91345	9	64094	9	39271	9	16937
10	23303731	10	76560	10	51819	10	29569
11	16120	11	89029	11	64370	11	42204
12	28512	12	23701501	12	76924	12	54842
13	40906	13	13976	13	89481	13	67483
14	53303	14	26453	14	24102041	14	80127
15	65703	15	38933	15	14603	15	92774
16	78103	16	51416	16	27168	16	24505424
17	90510	17	63901	17	39736	17	18076
18	23402918	18	76389	18	52307	18	30731
19	15328	19	88380	19	64880	19	43389
20	27741	20	23801374	20	77456	20	56050
21	40157	21	13870	21	90035	21	68714
22	52575	22	26369	22	24202617	22	81381
23	64996	23	38871	23	15203	23	94051
24	77419	24	51375	24	27789	24	24606723
25	89845	25	63882	25	40379	25	19398
26	23502374	26	76392	26	52972	26	32076
27	14706	27	88905	27	65568	27	44757
28	27140	28	23901420	28	78167	28	57441
29	39577	29	13938	29	90768	29	70128
30	52017	30	26459	30	24303372	30	82818

3. 8 Degrees.

32. Degrees.

M.	Equall P.	M.		M.	Equall P.	M.	
1	95511	31	77640	1	62435	31	49960
2	24708206	2	90423	2	75308	2	62925
3	20904	3	25103209	3	88184	3	75894
4	33605	4	15998	4	25501063	4	88866
5	46309	35	28790	5	13945	35	25901841
6	59016	6	41585	6	26830	6	14819
7	71726	7	54383	7	39718	7	27803
8	84439	8	67184	8	52609	8	40784
9	97155	9	79988	9	65503	9	53771
10	24809874	40	92795	10	78401	40	66761
1	22596	1	25205605	1	91302	1	79755
2	35320	2	18418	2	25604206	2	92752
3	48047	3	31234	3	17113	3	26005752
4	60777	4	44053	4	30023	4	18755
15	73510	45	56875	15	42936	45	31761
6	86246	6	69700	6	55852	6	44770
7	98985	7	82528	7	68771	7	57782
8	24911727	8	95359	8	81693	8	70798
9	24472	9	25308193	9	94618	9	83817
20	37220	50	21030	20	25707546	50	96839
1	49971	1	33870	1	20477	1	26109864
2	62725	2	46713	2	33411	2	22892
3	75482	3	59559	3	46348	3	35923
4	88242	4	72408	4	59289	4	48958
25	25001005	55	85260	25	72233	55	61996
6	13770	6	98115	6	85180	6	75037
7	26538	7	25410973	7	98130	7	88081
8	39309	8	23834	8	25811083	8	26201128
9	52083	9	36698	9	24039	9	14178
30	64860	60	49565	30	36998	60	27232

40. Degrees.

41. Degrees.

M.	Equall P.	M.		M.	Equall P.	M.	
1	40289	31	33488	1	29631	31	28793
2	53349	2	45645	2	42887	2	42151
3	66412	3	59805	3	56147	3	55513
4	79478	4	72968	4	69410	4	68878
5	92548	5	86135	5	82676	5	82247
6	26305621	6	99305	6	95946	6	95619
7	18697	7	26712478	7	27109219	7	27508995
8	31776	8	25655	8	22496	8	22374
9	44858	9	38835	9	35776	9	35756
10	57944	10	52018	10	49059	40	49142
1	71033	1	65204	1	62346	1	62531
2	84125	2	78394	2	75636	2	75924
3	97220	3	91587	3	88929	3	89320
4	26410318	4	26804783	4	27202226	4	27602710
15	23420	45	17983	15	15526	45	16123
6	36525	6	31186	6	28830	6	29530
7	49633	7	44392	7	42137	7	42940
8	62744	8	57602	8	55447	8	56354
9	75859	9	70815	9	68761	9	69771
20	88977	50	84031	20	81078	50	83192
1	26502098	1	97251	1	95399	1	96610
2	15222	2	26910474	2	27308723	2	27710044
3	28350	3	23700	3	22050	3	23475
4	41481	4	36930	4	35381	4	36916
25	54615	55	50163	25	48715	55	50348
6	67752	6	63399	6	62053	6	63790
7	80893	7	76639	7	75394	7	77235
8	94037	8	89882	8	88739	8	90684
9	26607184	9	27003128	9	27402087	9	27804136
30	20334	60	16378	30	15438	60	17592

42. Degrees.

43. Degrees.

M.	Equall P.	M.		M.	Equall P.	M.	
1	27831051	31	36486	1	45179	31	57215
2	44514	2	50056	2	58859	2	71008
3	57980	3	63630	3	72543	3	84805
4	71450	4	77207	4	86231	4	98606
5	84923	35	90788	5	99922	35	29112411
6	98400	6	28304373	6	28713617	6	26219
7	27911881	7	17961	7	27316	7	40031
8	25365	8	31553	8	41019	8	53847
9	38853	9	45149	9	54725	9	67667
10	52344	40	58748	10	68435	40	81491
1	65839	1	72351	1	82149	1	95319
2	79337	2	85958	2	95867	2	29209150
3	92839	3	99568	3	28809588	3	22985
4	28006344	4	28413182	4	23313	4	36814
15	19853	45	26799	15	37042	45	50667
6	33366	6	40420	6	50775	6	64514
7	46882	7	54045	7	64511	7	78365
8	60402	8	67673	8	78251	8	92220
9	73925	9	81305	9	91995	9	29306078
20	87452	50	94941	20	28905743	50	19940
1	28100983	1	28508581	1	19494	1	33806
2	14517	2	22224	2	33249	2	47676
3	28055	3	35871	3	47008	3	61550
4	41596	4	49522	4	60771	4	75428
25	55141	55	63176	25	74537	55	89310
6	68689	6	76834	6	88307	6	29403196
7	82241	7	90496	7	29002081	7	17085
8	95797	8	28604161	8	15859	8	30978
9	28209356	9	17830	9	29641	9	44875
30	22919	60	31503	30	43426	60	58776

44. Degrees.

45. Degrees.

M.	Equall P.	M.	Equall P.	M.	Equall P.	M.	Equall P.
1	72681	31	91667	1	14363	31	40567
2	86590	2	29905695	2	128413	2	54843
3	29500503	3	19727	3	42567	3	69121
4	14420	4	33763	4	56725	4	83405
5	28341	35	47803	5	70887	35	97693
6	42266	6	61847	6	85053	6	30811985
7	56195	7	75895	7	99224	7	26281
8	70127	8	89947	8	30413399	8	40582
9	84063	9	30004003	9	27578	9	54887
10	98003	40	18063	10	41761	40	69195
1	29611947	1	32127	1	55948	1	83509
2	25895	2	46195	2	70139	2	97827
3	39847	3	60267	3	84334	3	30212149
4	53803	4	74343	4	98534	4	26475
15	67763	45	88423	15	30512738	45	40805
6	81737	6	30102507	6	26946	6	55140
7	95695	7	16595	7	41158	7	69479
8	29709667	8	30688	8	55374	8	83822
9	23643	9	44785	9	69594	9	98170
20	37623	50	58885	20	83819	50	31012522
1	51607	1	72990	1	98048	1	26878
2	65595	2	87099	2	30612281	2	41238
3	79587	3	30201212	3	26518	3	55603
4	93583	4	15329	4	40759	4	69972
25	29807583	55	29450	25	55005	55	84345
6	21587	6	43575	6	69255	6	98723
7	35595	7	57704	7	83509	7	31113105
8	49607	8	71837	8	97767	8	27491
9	63623	9	85975	9	30712029	9	41882
30	77643	60	30300117	30	26296	60	56277

46. Degrees.

47. Degrees.

M.	Equal P.	M.	Equal P.	M.	Equal P.	M.	Equal P.
1	31170676	31	31604695	1	42728	31	84882
2	85080	2	19231	2	57399	2	99693
3	99488	3	33771	3	72075	3	32514508
4	3113900	4	48316	4	86756	4	29328
5	28317	35	62865	5	32101441	5	44153
6	42738	6	77419	6	16131	6	58983
7	57164	7	91977	7	30825	7	73817
8	71594	8	31766540	8	45524	8	88656
9	86028	9	21107	9	60128	9	32603500
10	31300467	40	35679	10	74936	40	18349
1	14910	1	50255	1	89649	1	33202
2	29357	2	64836	2	32104366	2	48060
3	43809	3	79421	3	19088	3	62923
4	58265	4	94012	4	33815	4	77791
15	72726	45	31808605	5	48546	5	92663
6	87191	6	23204	6	63282	6	31707540
7	31401660	7	37807	7	78023	7	22422
8	16134	8	52415	8	92768	8	37309
9	30612	9	67027	9	32307518	9	52200
20	45095	50	81644	20	22273	50	67096
1	59582	1	96265	1	37032	1	81997
2	74073	2	31910891	2	51796	2	96903
3	88569	3	25522	3	66565	3	32811814
4	32503069	4	40156	4	81338	4	26729
25	17574	55	54795	5	96116	5	41649
6	32083	6	69439	6	32410899	6	56574
7	46597	7	84088	7	25686	7	71504
8	61115	8	98741	8	40478	8	86439
9	75637	9	32013399	9	55275	9	31901378
30	90164	60	28061	30	70076	60	16322

48. Degrees.

M.	Equall P.	M.
1	31271	31
2	46225	2
3	61184	3
4	76148	4
5	91116	35
6	33006089	6
7	21067	7
8	36050	8
9	51038	9
10	66031	40
11	81029	1
12	96032	2
13	33111039	3
14	26051	4
15	41068	45
16	56090	6
17	71117	7
18	86149	8
19	33201186	9
20	16228	50
21	31275	1
22	46327	2
23	61383	3
24	76444	4
25	91510	55
26	33306581	6
27	21657	7
28	36738	8
29	51824	9
30	66915	60

49. Degrees.

M.	Equall P.	M.
1	37224	31
2	52476	2
3	67783	3
4	82995	4
5	98263	35
6	33913536	6
7	28814	7
8	44097	8
9	59385	9
10	74678	40
11	89976	1
12	34005280	2
13	20589	3
14	35903	4
15	51222	45
16	66546	6
17	81875	7
18	97210	8
19	34112550	9
20	27895	50
21	43245	1
22	58600	2
23	73961	3
24	89327	4
25	34204698	55
26	10074	6
27	35453	7
28	40842	8
29	66234	9
30	81631	60

50. Degrees.

51. Degrees.

M.	Equall P.	M.	Equall P.	M.	Equall P.	M.	Equall P.
1	61569	31	30968	1	35705369	31	84914
2	77137	32	46700	2	21270	32	36200989
3	92710	33	62438	3	37177	33	17070
4	34808288	34	78181	4	53090	34	33157
5	23872	35	93930	5	69008	35	49250
6	39461	36	35309684	6	84932	36	65349
7	55056	37	25444	7	35800862	37	81458
8	70656	38	41209	8	16798	38	97565
9	86261	39	56980	9	32739	39	36313681
10	34901872	40	72757	10	48686	40	29803
11	17488	41	88539	11	64639	41	45931
12	33110	42	35404327	12	80598	42	62065
13	48737	43	20120	13	96562	43	78205
14	64370	44	35919	14	35912532	44	94351
15	80008	45	51724	15	28508	45	36410503
16	95652	46	67534	16	44490	46	26661
17	35011301	47	83350	17	60477	47	42825
18	26956	48	99172	18	76470	48	58995
19	42616	49	35514999	19	92469	49	75171
20	58282	50	30832	20	36008474	50	91353
21	73953	51	46671	21	24485	51	36507541
22	89630	52	62515	22	40502	52	23735
23	35105312	53	78365	23	56524	53	39935
24	21000	54	94221	24	72552	54	56141
25	36693	55	35610082	25	88586	55	72353
26	52392	56	25949	26	36104626	56	88571
27	68096	57	41822	27	20672	57	36604795
28	83806	58	57700	28	36724	58	21025
29	99521	59	73584	29	52782	59	37261
30	35215242	60	89474	30	68845	60	53503

52. Degrees.

M.	Equall P.	M.	
1	69751	31	60041
2	86005	2	76480
3	36702265	3	92925
4	18531	4	37209376
5	34804	35	25834
6	51083	6	42298
7	67368	7	58768
8	83659	8	75244
9	99956	9	91727
10	36816259	40	37308216
1	32568	1	24711
2	48883	2	41212
3	65204	3	57720
4	81531	4	74234
15	97865	45	90754
6	36914205	6	37407281
7	30551	7	23814
8	46903	8	40353
9	63261	9	56899
20	79625	50	73451
1	95925	1	90009
2	37012372	2	37506574
3	28755	3	23145
4	45144	4	39723
25	61539	55	56307
6	77940	6	72897
7	94348	7	89494
8	37110762	8	37606097
9	27182	9	22706
30	43608	60	39322

53. Degrees.

M.	Equall P.	M.	
1	55944	31	57629
2	72573	2	74453
3	89208	3	91284
4	37705850	4	38208122
5	22498	5	24966
6	39153	6	41817
7	55814	7	58675
8	72481	8	75539
9	89155	9	92410
10	37805835	40	38309288
1	22522	1	26172
2	39215	2	43063
3	55915	3	59961
4	72621	4	76865
5	89334	5	93776
6	37906053	6	38410694
7	22779	7	27619
8	39511	8	44550
9	56250	9	61488
20	72995	50	78433
1	89747	1	95384
2	38006506	2	38512342
3	23271	3	29307
4	40043	4	46279
5	56821	5	63258
6	73606	6	80243
7	90397	7	97235
8	38107195	8	38614234
9	24000	9	31240
30	40811	60	48253

54 Degrees.

55 Degrees.

M.	Equall P.	M.		M.	Equall P.	M.	
1	65272	31	79055	1	99169	31	25812
2	82298	2	96289	2	39716617	2	43482
3	99331	3	39213530	3	34073	3	61159
4	38716371	4	30778	4	51536	4	78844
5	33418	35	48033	5	69006	35	96536
6	50472	6	65295	6	86484	6	40314236
7	67532	7	82564	7	39803969	7	31943
8	84599	8	99840	8	21461	8	49658
9	38801673	9	39317124	9	38960	9	67380
10	18754	40	34415	10	56467	40	85110
1	35842	1	51713	1	73981	1	40402847
2	52937	2	69018	2	91502	2	20592
3	70039	3	86330	3	39909031	3	38344
4	87148	4	39403649	4	26567	4	56104
15	38904263	45	20975	15	44110	45	73872
6	21385	6	30308	6	61661	6	91647
7	38514	7	55648	7	79219	7	40509430
8	55650	8	72996	8	96785	8	27220
9	72793	9	90351	9	40014358	9	45018
20	89943	50	39507713	20	31938	50	62824
1	39007100	1	25082	1	49526	1	80637
2	24264	2	42458	2	67121	2	98458
3	41435	3	59841	3	84724	3	40616287
4	58613	4	77232	4	40102334	4	34123
25	75798	55	94630	25	19951	55	51967
6	92990	6	39612035	6	37576	6	69819
7	39110189	7	29447	7	55208	7	87678
8	27395	8	46867	8	72848	8	40705545
9	44608	9	64294	9	90495	9	23420
30	61828	60	81728	30	40208150	60	41303

56. Degrees.

57. Degrees.

M.	Equall P.	M.		M.	Equall P.	M.	
1	59193	31	99528	1	47038	31	42401966
2	77091	2	41317661	2	65415	2	20594
3	94997	3	35802	3	83800	3	39231
4	40812910	4	53951	4	41902193	4	57876
5	30831	35	72103	5	20595	35	76530
6	48760	6	90273	6	39005	6	95192
7	66697	7	41408446	7	57423	7	42513863
8	84641	8	26527	8	75849	8	32542
9	40903593	9	44817	9	94284	9	51230
10	20553	40	63015	10	42012727	40	69927
11	38521	11	81221	11	31178	11	88632
12	56497	12	99435	12	49638	12	42607346
13	74480	13	41517657	13	68106	13	26068
14	92471	14	35887	14	86582	14	44799
15	41010470	15	54125	15	42105067	15	63539
16	28477	16	72371	16	23560	16	82287
17	46492	17	90625	17	42061	17	42701044
18	64515	18	41608837	18	60571	18	19810
19	82545	19	27157	19	79089	19	38584
20	41100583	20	45435	20	97616	20	57367
21	18629	21	63722	21	42216151	21	76159
22	36683	22	82017	22	34694	22	94959
23	54745	23	41700320	23	53246	23	42813768
24	72815	24	18631	24	71806	24	32586
25	90893	25	36950	25	90375	25	51412
26	41208979	26	55277	26	42308952	26	70247
27	27073	27	73613	27	27538	27	89091
28	45175	28	91957	28	46132	28	42907944
29	63285	29	41810309	29	64735	29	26806
30	81403	30	28669	30	83346	30	45676

58. Degrees.

59. Degrees.

510
150

M.	Equal P.	M.		M.	Equal P.	M.	
1	64555	31	35063	1	44113764	31	44700940
2	83443	2	54219	2	33198	2	20662
3	43002340	3	73385	3	52642	3	40394
4	21246	4	92560	4	72095	4	60135
5	40160	35	43611744	5	91558	35	79886
6	59083	6	30937	6	44211030	6	99647
7	78015	7	50139	7	30512	7	44819418
8	96956	8	69350	8	50003	8	39199
9	43115906	9	88570	9	69504	9	58989
10	34865	40	43707800	10	89014	40	78789
1	53833	1	27039	1	44308534	1	98599
2	72809	2	46287	2	28063	2	44918419
3	91794	3	65544	3	47602	3	38249
4	43210788	4	84811	4	67150	4	58089
15	29791	45	43804087	15	86708	45	77939
6	48803	6	23372	6	44406275	6	97799
7	67824	7	42666	7	25852	7	45017668
8	86854	8	61970	8	45438	8	37547
9	43305893	9	81283	9	65034	9	57436
20	24941	50	43900605	20	84640	50	77335
1	43998	1	19936	1	44504255	1	97244
2	63064	2	39277	2	23880	2	45117163
3	82139	3	58627	3	43515	3	37092
4	43401222	4	77986	4	63159	4	57031
25	20316	55	97355	25	82813	55	76980
6	39418	6	44016733	6	44602477	6	96939
7	58529	7	36120	7	22150	7	45216908
8	77649	8	55517	8	41833	8	36887
9	96778	9	74923	9	61526	9	56876
30	43515916	60	94339	30	81228	60	76876